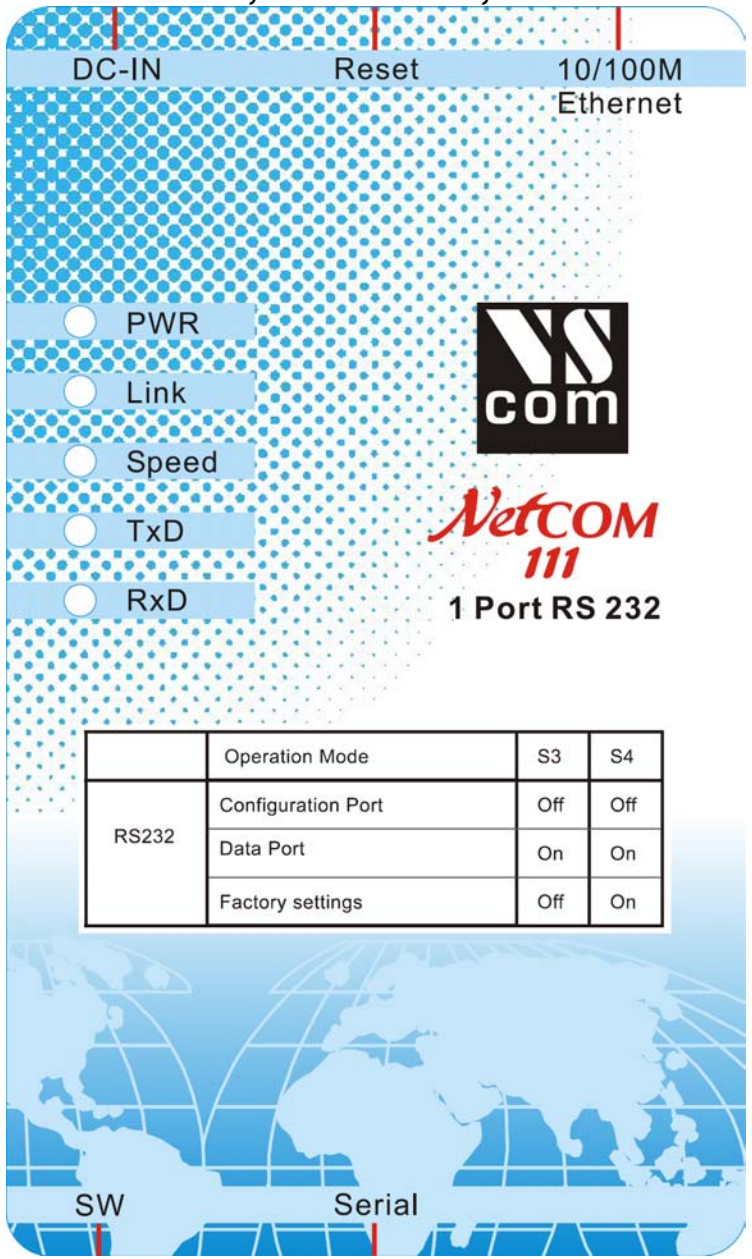
VS NetCom Devices

User Manual for NetCom 111, 113, 211, 411, 413 and 811, 813



	Operation Mode	S3	S4
RS232	Configuration Port	Off	Off
	Data Port	On	On
	Factory settings	Off	On

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2. INTRODUCTION

This manual covers several different models of NetCom Devices. In general the operation is the same on all models, except where explicitly noted otherwise.

The VS NetCom devices are designed to remotely operate serial ports over networks. They have 100Mbit Ethernet as the network interface. The transport is implemented via TCP/IP protocol. Therefore control is available via Ethernet, Intranet and Internet.
The supplied driver software hides the network transfer from your applications. Software applications using standard COM ports need no change to operate via NetCom through the virtual serial ports.

The devices come with a steel case well suited for industrial environments.

NetCom supports high serial speeds up to 460 kbps. The serial ports operate in common RS-232 mode. The models NetCom 113 and 413 also offer the industrial RS-422 and RS-485 configuration. In RS-485 mode the NetCom may use the Automatic Receive Transmit (ART) control logic to follow the RS-485 specifications for transmitting data. No special code is necessary to be implemented in your software applications.

2.1. FEATURES

- Single power supply 9V-30V, 200-600 mA@12V
- Ethernet 10/100BaseTx for auto-configuration
- Three serial port interfaces: RS-232 (and RS-422/485)
- Max. 460.800 bps, half- and full-duplex
- TCP/IP configuration fixed or by DHCP
- Easy remote configuration via SNMP
- Drivers for Windows™ and Linux operating systems
- Documented interface for every networked operating system

2.2. PRODUCT SPECIFICATIONS

Most of the characteristics are common for all models. However some must differ from model to model.

2.2.1. COMMON CHARACTERISTICS

Processor	ARM7 (S3C4510B)
Memory	8MB SDRAM 1MB Flash (2MB with 8 serial ports)
Ethernet connector	RJ45 10BaseT/100BaseTx
Serial Speed	14 bps up to 460.8 kbps
Parity	None, Even, Odd, Mark, Space
Data bits	5, 6, 7, 8
Stop bits	1, 2 (1.5)
Protocols	TCP/IP, UDP, SNMP, DHCP, ICMP, ARP, Telnet, RTelnet, HTTP
Management	Serial console, Telnet, Webbrowser, SNMP
Driver software	Windows 2000/XP, Windows NT, Linux (Windows 95/98/ME later)
Management software	Driver installation and configuration program Management console
Operating temp.	0° to 55°C
Approval	CE, FCC

Table 1: Specifications, common

2.2.2. SPECIFIC CHARACTERISTICS

2.2.2.1. NetCom 111 and 113

Serial connector	DB9 female (similar to Modem)	
Serial ports	1 × RS-232 configured by DIP switch, (RS-422/485 on NetCom 113 only)	
Serial signals	RS-232	TxD, RxD, RTS, CTS, DTR, DSR, DCD, RI, GND
	RS-422, RS-485 4-wire	Tx+/Tx-, Rx+/Rx-, GND
	RS-485 2-wire	Data+/Data-, GND
Power requirement	DC 9V to 30V, 200 mA@12V	
Dimensions	73×115×27 mm³ (W×D×H) 101×121×27 mm³ with connectors	
Weight	250 g	

Table 2: Characteristics of NetCom 111 and 113

2.2.2.2. NetCom 211

Serial connector	RJ45, Adapter cable to DB9 male (like PC)
Serial ports	2 × RS-232
Serial signals	TxD, RxD, RTS, CTS, DTR, DSR, DCD, GND
Power requirement	DC 9V to 30V, 300 mA@12V
Dimensions	73×115×27 mm³ (W×D×H) 101×121×27 mm³ with connectors
Weight	200 g

Table 3: Characteristics of NetCom 211

2.2.2.3. NetCom 411 and 413

Serial connector	DB9 female (similar to Modem)	
Serial ports	4 × RS-232 configured by DIP switch, (RS-422/485 on NetCom 413 only)	
Serial signals	RS-232	TxD, RxD, RTS, CTS, DTR, DSR, DCD, RI, GND
	RS-422, RS-485 4-wire	Tx+/Tx-, Rx+/Rx-, GND
	RS-485 2-wire	Data+/Data-, GND
Power requirement	DC 9V to 30V, 400 mA@12V	
Dimensions	169×93×29 mm³ (W×D×H) 169×99×29 mm³ with connectors	
Weight	500 g	

Table 4: Characteristics of NetCom 411 and 413

2.2.2.4. NetCom 811 and 813

Serial connector	DB9 female (similar to Modem)	
Serial ports	8 × RS-232 configured by DIP switch, (RS-422/485 on NetCom 813 only)	
Serial signals	RS-232	TxD, RxD, RTS, CTS, DTR, DSR, DCD, RI, GND
	RS-422, RS-485 4-wire	Tx+/Tx-, Rx+/Rx-, GND
	RS-485 2-wire	Data+/Data-, GND
Power requirement	DC 9V to 30V, 600 mA@12V	
Dimensions	169×93×42 mm³ (W×D×H) 169×99×42 mm³ with connectors	
Weight	900 g	

Table 5: Characteristics of NetCom 811 and 813

2.3. PACKING LIST

√ VS NetCom
√ Power supply adapter,
  9V 0.5A for NetCom 111, 113 and 211
  12V 1 A for NetCom 411 and 413
  12V 1 A for NetCom 811 and 813
√ Serial Null Modem adapter for each port
√ CD-ROM with driver and configuration software
√ Quick Installation Guide

3. HARDWARE CONFIGURATION

3.1. POWER SUPPLY

The NetCom device is powered by a single 9-30V power supply. It requires 200 mA up to 1400 mA of current, depending on the device type and voltage supplied. A suitable power supply adapter is part of the packaging. Connect the cable to the power jack at the rear side of NetCom, and put the adapter into the socket.

The Power LED on NetCom (red) will light.
You can connect a power supply of your choice, providing the technical requirements are met.

3.2. ETHERNET

The connector for network is the usual RJ45. Simply connect it to your (switching) Hub. When the connect is done the Link LED on NetCom (yellow) will light. When data traffic occurs on the network, this LED will blink. It depends on your network whether a 100Mbit or a 10Mbit connect will be established. A 100Mbit net causes the Speed LED on NetCom (green) to light, otherwise it will remain dark.

Red LED	Yellow LED	Green LED	Status
Off	--	--	Device off, no power
On	Off	Off	No connection
On	On	Off	10Mbit connection established
On	Blink	Off	10Mbit data transfer (traffic)
On	On	On	100Mbit connection established
On	Blink	On	100Mbit data transfer (traffic)

Table 6: LED Function

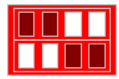
3.3. SERIAL PORT SIMPLE SETTINGS

There is one set of 4 (2) Dip switches to configure the operation mode of the NetCom Device. On NetCom 413 and 813 there is a separate set for each serial port. Before connecting a serial device, the serial port configuration must be completed.

Warning: a bad configuration may cause serious damage in the NetCom or the connected device.

To avoid these problems, it is recommended not to connect a device to the serial ports in the first installation. Also all serial ports should be configured for RS232. This is done by setting the DIP switches like these examples. Depending on your NetCom Device you have two or for positions:

NetCom 211 Other devices



4. WINDOWS DRIVER QUICK INSTALLATION

This section describes the minimum steps required to install the Windows Driver and Management programs. Most configuration options are ignored. They are covered in later sections.
Before starting installation, it is essential to have an IP configuration ready for the NetCom Device to install. You may read the section TCP/IP Description below. In many networks the default configuration is fine. If in doubt, please ask your Network Administrator for help.
The following description is based on Windows XP Professional, with Service Pack 2 installed. The installation on other configurations of Windows XP is similar.

4.1. INSTALLATION PROCEDURE

The installation of drivers is described first. This is followed by a procedure to verify a correct installation. The last part of this section is the uninstall process.

4.1.1. START THE INSTALLATION WIZARD

Image 1:
Installation Wizard

This is the Installation Wizard, it is named VSNSETUP.EXE. You'll find it on the CD-ROM shipped with the NetCom, in the directory responsible for your operating system. The drivers are also available on the Internet, in the latest version. The Installation Wizard for Windows NT is named VSNSTUNT.EXE. Start this program to install the drivers.

Your screen displays a Vscom logo. Select the folder to install programs and drivers into. In most situations the suggested setting is fine, just hit enter.

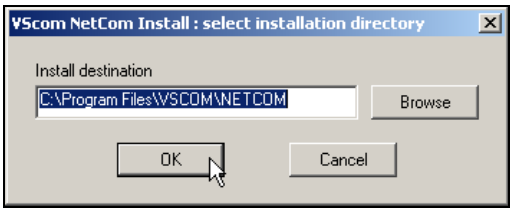


Image 2: Start Driver Installation

4.1.2. FIND AND CONFIGURE NETCOM DEVICES

Some files are copied to your hard disk, this is the usual process similar to other Windows installations. When all files are copied, the NetCom Manager[1] program is started. This searches for all NetCom Devices on your network.

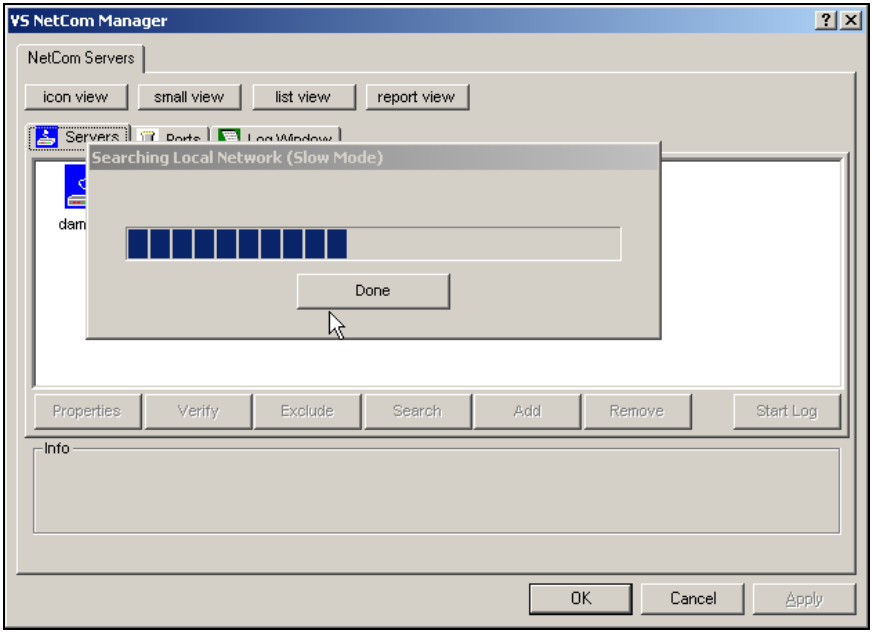


Image 3: Discover and Select NetCom Devices for Installation

After short time the search process is finished. All discovered NetCom are listed. In your very first installation of NetCom Devices and Drivers you should connect only one NetCom to your network. This single Device is listed here. Identify it by comparing the serial number shown in the NetCom Manager.

[1] This program is covered in detail in a later section. For now follow the minimum steps.

4.1.2.1. Configure IP Parameters

As mentioned above, it is important to configure the NetCom to operate in your network. In many networks this is done by a special server. Please ask your Network Administrator for information. If you need to define parameters manually, double-click the devices icon.

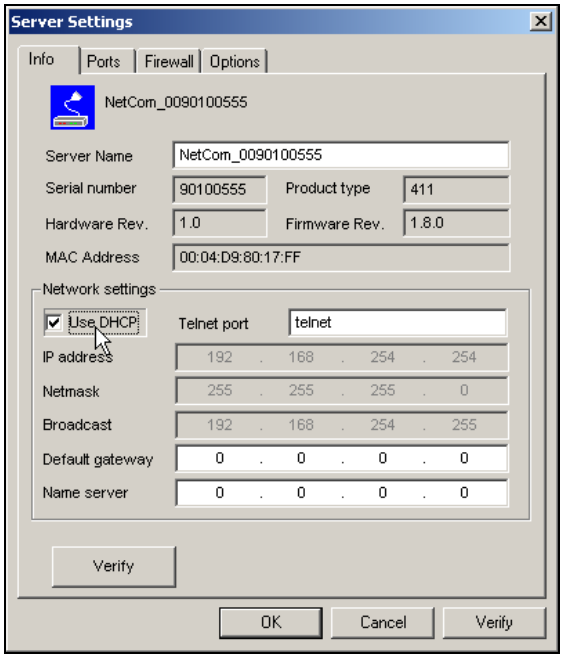


Image 4: Define NetComs IP Configuration

This panel opens. Deselect the Option of “Use DHCP”, and place your parameters as “IP address”, “Netmask” and “Broadcast”. Click on the “OK” button.

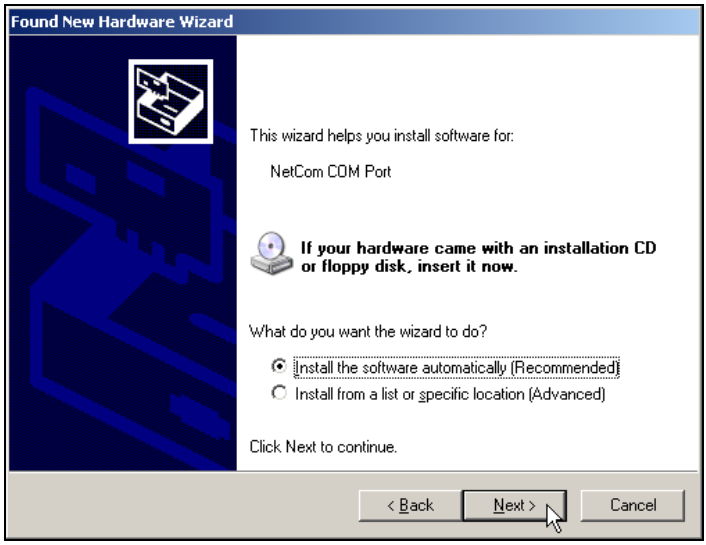
4.1.3. INSTALL DRIVERS

You are now back in the NetCom Manager. Click the "OK" button, the installation continues. Windows detects the serial ports on the fresh NetCom as new Hardware. Since Windows XP Service Pack 2 you are asked about to get latest drivers.

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).
Read our privacy policy
Can Windows connect to Windows Update to search for software?
Yes, this time only
Yes, now and every time I connect a device
No, not this time
Click Next to continue.
< Back
Next >
Cancel

Image 5: Use current drivers dialog

There are no later drivers on the Windows Update website. Select the third item, and click on "Next". This question neither appears on Windows XP prior to SP2, nor on any previous Windows version.


Found New Hardware Wizard
This wizard helps you install software for:
NetCom COM Port
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel
Image 6: Install drivers for the serial ports

The pre-selected automatic installation is fine, just click on “Next”. The driver files are already copied to your hard disk. Now Windows installs them in the system directory. To “Finish” the installation click on that button as it appears.

These latest steps happen for each serial port on the NetCom Device. Just repeat the procedure, until all ports are successfully installed. Windows will show you this.

In most situations it is not required to reboot the system. Of course you can do that now, to test the drivers.

4.2. VERIFY THE INSTALLATION

Image 7: VScom drivers in the Start Menu

In the Start Menu you’ll find “Vision Systems GmbH”, a new program group. The installed programs are the NetCom Manager and an option for uninstallation. This group is not installed on Windows NT.

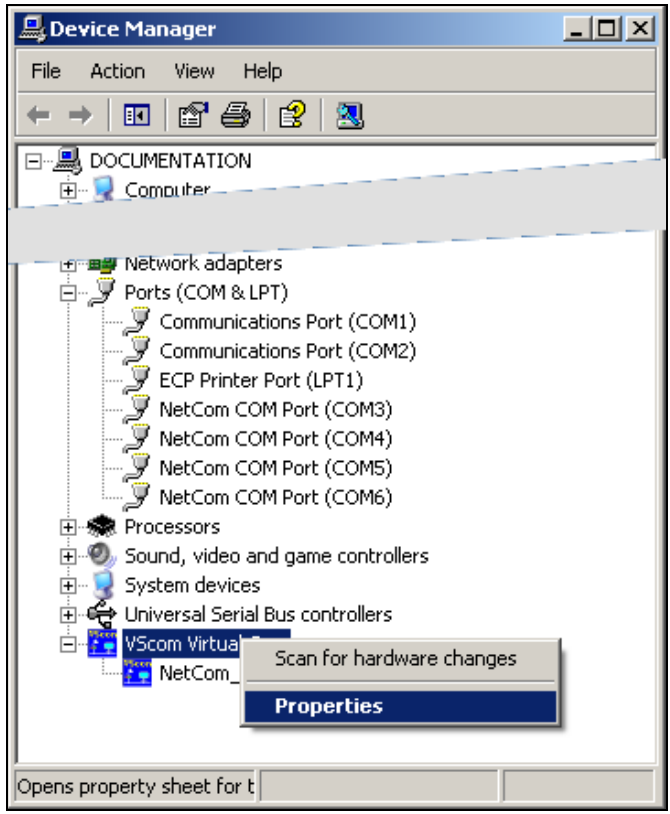


Image 8: NetCom in Device Manager

In the Device Manager the serial ports are listed in the usual section "Ports". Additionally there is a new device class "Vscom Virtual Com". All installed NetCom Devices are listed herein. The available options are described later.

Image 9:
NetCom Manager NT

On Windows NT there is no Device Manager. You'll find the serial ports listed in the Control panel in the "Ports" applet. To configure the NetCom and special port options, there is a new applet named NetCom Manager.

4.3. UNINSTALL THE DRIVERS

To completely uninstall the NetCom Drivers and files, there are three methods. The usual way is to use the Add/Remove Programs applet in the Control Panel, and remove the NetCom Drivers. This will start the NetCom uninstallation program.

Image 10: Uninstall NetCom Drivers

As a second way you may start the Uninstall program in the start menu. The third method is to start the Installation Wizard again. This will detect the drivers on the system. You have the options to repair the current installation, or to remove the installed drivers.

5. SOFTWARE CONFIGURATION

The NetCom Devices may also be used without the installation of a driver software. Customer applications contact the NetCom directly, using network functions. These setups require independent configuration of the NetCom Device and the serial ports. There are several ways to do this configuration. The NetCom offers a Webbrowser interface, a Manager program to use in Windows, configuration via serial port, via Telnet and also via SNMP. This SNMP option is not covered in this manual, please see separate documentation. The serial port option is a fallback, if every other way of configuration fails. The options are here described in the order Web, Manager program, Telnet and serial port.

Image 11:
NetCom Manager

Configurations via Webbrowser and via Telnet require a functional TCP/IP connection to the NetCom Device. And you must also know the IP-Address of the NetCom, to contact it. The easiest way to retrieve this information is the NetCom Manager program. So here is a very minimal description of this program. You find this program on the CD-ROM shipped with the NetCom Device. In Windows 2000, XP and 2003 it is named NETCOMMGR.EXE, while in Windows NT the name is NETCOMMGRNT.EXE. Just double-click to start it direct from the CD-ROM. If you already installed the drivers, the program is also in the Start Menu.

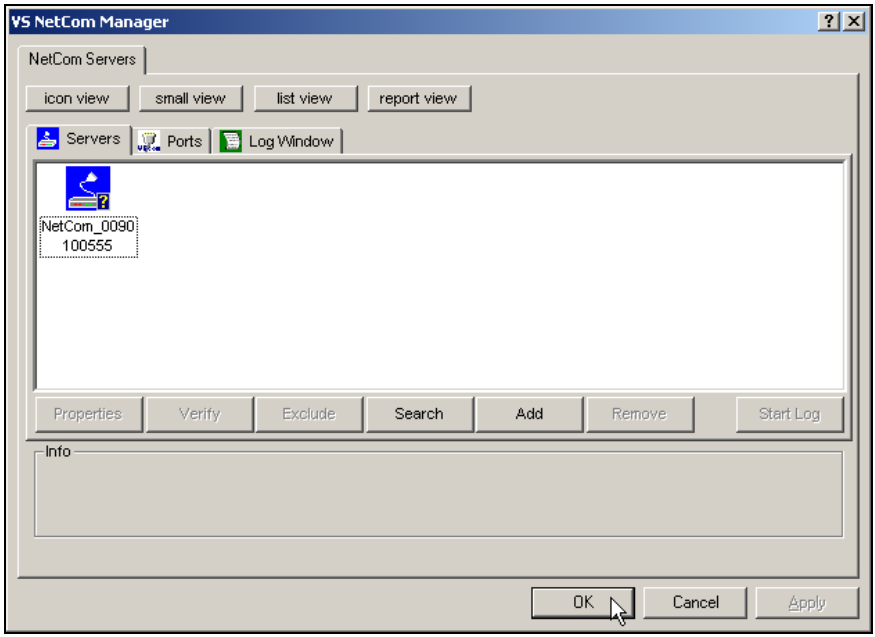


Image 12: NetCom Manager Servers Panel

Identify the NetCom Device by comparing the serial number. Double-click the Icon of the NetCom. You'll see the IP-Parameters. Note the "IP address", to use it in your browser or via Telnet.

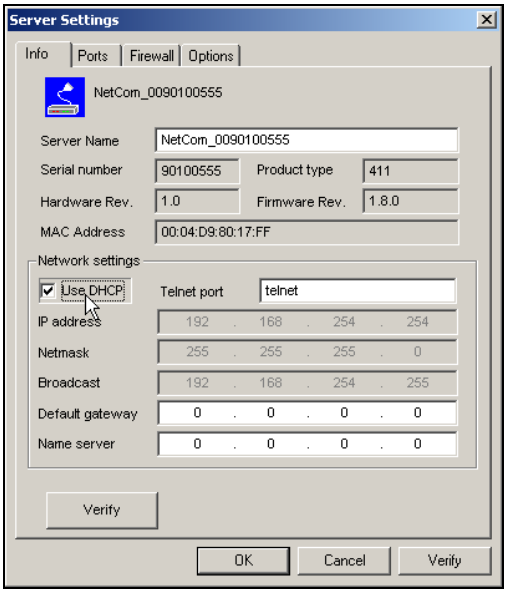


Image 13: NetCom IP-Parameters

5.1. CONFIGURE IN WEB-INTERFACE

Open your Webbrowser. In the address line type the address of the NetCom Server. In the example from above type http://192.168.254.254 as the target. You may do this on any operating system you prefer.

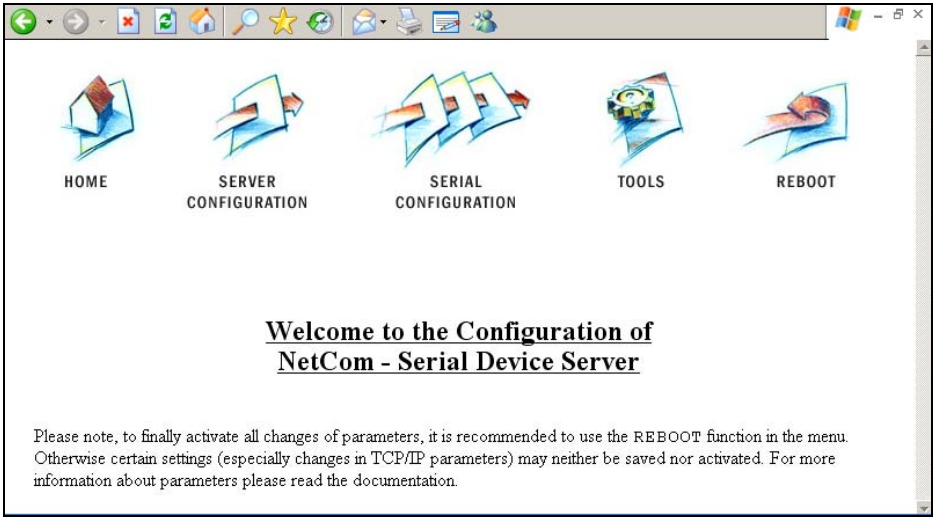

HOME
SERVER CONFIGURATION
SERIAL CONFIGURATION
TOOLS
REBOOT
Welcome to the Configuration of NetCom - Serial Device Server
Please note, to finally activate all changes of parameters, it is recommended to use the REBOOT function in the menu. Otherwise certain settings (especially changes in TCP/IP parameters) may neither be saved nor activated. For more information about parameters please read the documentation.

Image 14: Webinterface for configuration

The NetCom welcomes you with its "Home" screen. To access the different options of configuration, the images above function as a link. In many menus you'll see a blue question mark. This is a symbol for help. When clicked a short explanation pops up, informing about the function of this parameter. Some other settings require a reboot to save and activate them. Whenever this situation occurs, the NetCom requests a REBOOT.

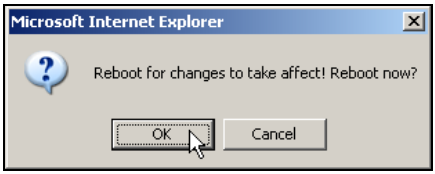


Image 15: Webinterface Request to Reboot

It is done like this here, you may reboot now, or do that later when the configuration is finished.

5.1.1. WEBBROWSER SERVER CONFIGURATION

The Server Configuration is a very long menu. It is divided in its logical sections throughout this document.

5.1.1.1. Server Info

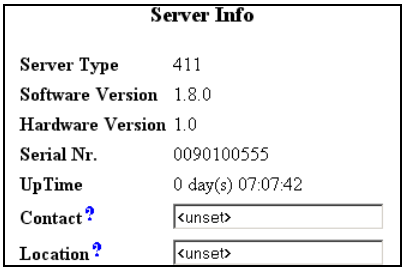


Image 16: Web Panel Server Information

Information about the selected NetCom is displayed as "Server Info". Starting with the "Server Type", this is the model of the NetCom, followed by the version of Software and Hardware. This will give a rough overview, which features are implemented, or need an upgrade of the firmware. The "Serial Nr." is important to identify the device you are configuring right now. For further information the "UpTime" is listed. "Contact" and "Location" are User-defined information. They may later help to find the device in the installation, and the person responsible for management.

5.1.1.2. Server Parameter

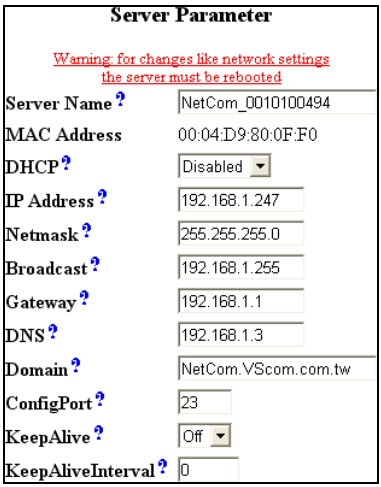


Image 17: Web Panel Server Parameter

The "Server Parameter" allow configuration of the NetComs name and of course all parameters in IP-settings. So far the name is just informative, e.g. in the NetCom Manager program or SNMP. Manual changes of IP parameters are only available with "DHCP" set as `Disabled`. When DHCP is not used, enter "IP Address" and "Netmask", as well as the "Broadcast" address. "Gateway" is required, if there are Routers in the network. DNS is used to access other stations by name. The "ConfigPort" is used to access the NetCom for administration via Telnet. It is suggested to use the standard value for Telnet, TCP port number 23. However it may be changed for different purposes. This does not change the function of the Telnet menus.

"KeepAlive" is an intrinsic function of the TCP/IP protocol. If used it causes network traffic, but problems are detected earlier. In a LAN this is usually not a problem. However, if used via DialUp connections this may cause problems. If this functions is used, you must define an interval in seconds. NetCom has a better chance to react on network

problems, or failed hosts. Even dropping an old connection may be useful in certain environments.

5.1.1.3. Authentication

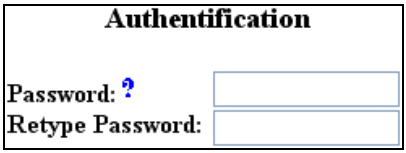


Image 18: Web Panel Authentication

”Authentication” sets a password to restrict access to the configuration of NetCom. To protect against accidental mistyping, you must type the Password again.

5.1.1.4. Date & Time

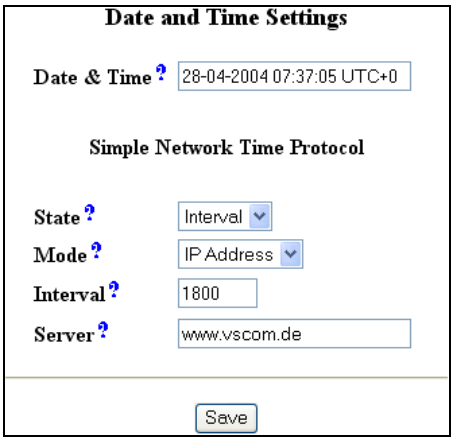


Image 19: Web Panel Date & Time

It may be helpful to have a correct time setting in the NetCom. You may manually enter the time here.
But since Firmware version 1.6 it is possible to configure NetCom for automatic time retrieval via SNTP. Define “State” for retrieval method of “Interval” or “Startup”, or “Off” of course. Parameter “Mode” is used to find the Time Server. It may be defined direct, or by DHCP. The “Interval” in seconds instructs NetCom to regularly check for an update of the internal time settings. The Time Server may be given by IP-Address, or by name. A name of course requires a DNS server, see at 5.1.1.2 Server Parameter above.
Below these options there is the button “Save”. This will store all configurations done here in the NetCom. In many cases NetCom requires a reboot to proceed.

5.1.2. WEBBROWSER SERIAL PORT CONFIGURATION

This is also a huge menu. Each serial port of the NetCom is listed in a separate Column. The top half of the parameters titled “Serial Settings” is directly related to common serial configurations. The bottom half titled “Transfer Settings” configures the operation mode of NetCom on the network. Each serial port is configured separately, there is no setting shared between ports.

5.1.2.1. Serial Settings

PortType	rs232
DefaultModel	16550
MaxBaudrate	460800
Model	16550
Baudrate	Manual
Manual	110
FlowType	XON/XOFF
DataBit	8
Parity	None
StopBit	1
RxFifoLength	2048
RxTriggerLevel	1248
TxFifoLength	2048
TxTriggerLevel	800

Image 20: Web Panel Serial Settings

When the NetCom is used via the Virtual Com Driver mode, the serial parameters are controlled by the application, which opened the serial port. However certain installations use a different operation, without Driver mode. Then the serial parameters must be defined separately. This is done in this panel.

Some NetCom devices allow to operate in RS422/485 modes. This is normally configured by DIP switches, the current setting is displayed as "PortType". The serial port is based on standard UARTs, the type and maximum speed are also displayed. These are hardware parameters, and can not be changed.

The current UART "Model" may be changed to a less advanced type. In some situations it may be desirable to deactivate the FIFO memory, or some other options.

The "Baudrate" may be selected in a drop-down list, or entered manually. If `Manual` is selected in the list, the value in the respective field is used to transmit data. NetCom checks if the configuration is possible, and warns otherwise. "DataBit" per character, "Parity" and "StopBit" are quite usual parameters.

The FlowType is available as standard configuration. There is also an Advanced setting, which gives very specific control to the user.

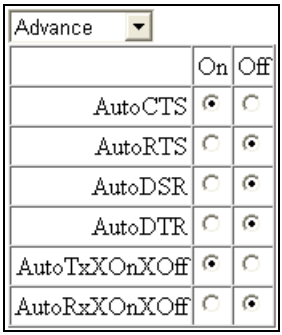


Image 21: Web Panel Advanced Flow Control

NetCom can generate Events on RTS, DTR or as XON/XOFF, when the serial receive buffer is filled/emptied. It will also respect the state of CTS, DSR or XON/XOFF when sending data to the connected serial device.

The "RxTriggerLevel" defines when NetCom sends the received data to the host. If the amount of data is this high, the data is sent. It does not matter if there is still data coming on the serial line. If less data is received, the NetCom waits some time for further data, before sending the buffer.

The "TxTriggerLevel" operates similar for the transmission. If the defined amount is received from the network, the NetCom does not accecpt more data to transmit.

5.1.2.2. Transfer Settings

Image 22: Serial Port Mode Selection

The Transfer Settings allow different modes. They are selected by the basic "Mode" setting. Depending on the current mode, only some of the many parameters are useful. The web configuration hides those parameters without function.

Basically the NetCom Devices can act as a server or as a client. As the main difference a server waits for clients to contact it, while a client actively contacts a server. A NetCom can do both, and partially both at the same time. Keep this in mind throughout this section.

5.1.2.2.1. Driver Mode

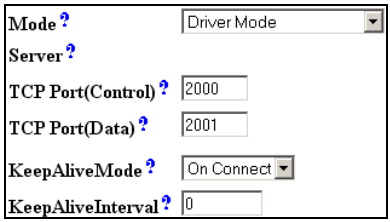


Image 23: Web Panel Driver Mode

Only very few parameters have a function in "Driver Mode". NetCom is operating as a *Server*. It accepts two connections per serial port. One connection is used to transmit the serial data, this is the "TCP Port(Data)". And the other is used to transmit control information, "TCP Port(Control)". This control connection includes the configuration of the serial port, as well as signals for changed Modem Status lines. This mode is required when the serial port is operated via the Virtual Com Driver, it is default.
The NetCom can check if the connected *Client* is still alive. This may be done, when a second Client wants to establish a connection (`On Connect`). It may also be done in regular intervals (`Polling`).

5.1.2.2.2. TCP Raw Server

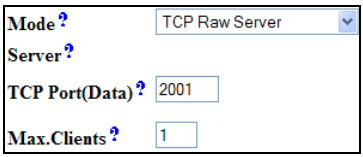


Image 24: Web Panel TCP Raw Server

As TCP Raw Server NetCom operates very simple. It only waits for incoming data connections in Raw IP mode. As with the Driver Mode Only the data connection is defined. As a special configuration NetCom allows for more than one connection at a time. If the number is raised, it is the responsibility of the customer to ensure correct operation.

5.1.2.2.3. TCP Raw Client

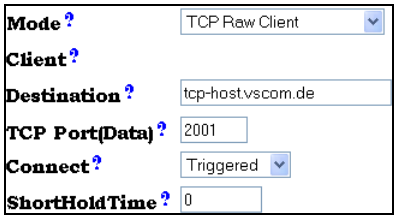


Image 25: Web Panel Raw Client

Also as Raw Client the NetCom requires very few parameters. Under certain conditions it establishes a Raw TCP connection to a pre-defined "Destination". To establish it, the "TCP Port(Data)" is used on the contacted host. Parameter "Connect" defines if NetCom uses the connection as `Permanent` or `Triggered`. Activity on the serial ports establishes the connection, inactivity of longer than the "ShortHoldTime" cause NetCom to close the connection.

5.1.2.2.4. Null Modem Tunnel

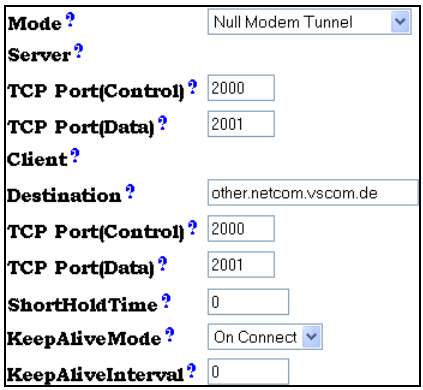


Image 26: Web Panel Null Modem Tunnel

This is a mixed mode, requiring parameters for server function and for the destination. The NetCom operates as a server while accepting connections in Driver Mode. If there is no current connection, the NetCom may establish a connection as a client. This is also a special connection, using the Driver Mode protocol. NetCom can will not only transmit serial data in both directions, it will also pass information about the current settings of the Modem Status lines. And it will itself set the Modem Control lines as required by the other host. Since this operation requires another NetCom to accept the connection, both NetCom together operate as a long Null-Modem cable. The data is sent via a tunnel through the network.

The configuration as *Server* (top) requires the same parameters as the Driver Mode, hence “TCP Port(Control)” and “TCP Port(Data)”.

The configuration as *Client* (bottom) first require a destination. Here it is given by name, but a direct IP-Address may be more ususal. On the destination there is also a “TCP Port(Control)” and “TCP Port(Data)” to accept the connect of the NetCom.

The connection is always established in `Triggered` mode, i.e. when some event occurs on the serial port. It is hold for the defined “ShortHoldTime”. As in the normal Driver Mode the function of a connected client can be checked via KeepAlive signals in different modes.

5.1.2.2.5. TCP Advanced Settings

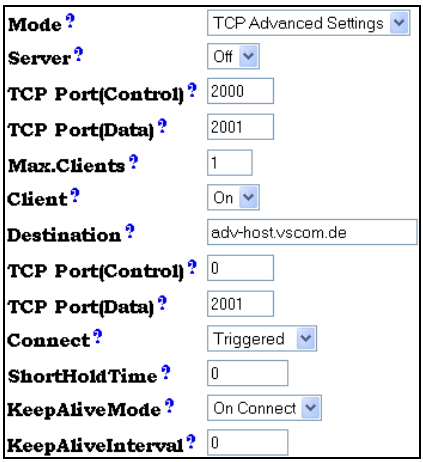


Image 27: Web Panel TCP Advanced Settings

All of the above operation modes are special configurations for options. In some situations none of the pre-defined modes fit the customers needs. When this is the case, the TCP Advanced Settings offer configuration of any Transfer parameter. Unusual combinations of Modes are possible with this, also standard modes with unusual parameters. For example, if for any reason a Null-Modem Tunnel with a permanent connection is required, use this mode and change the parameter "Connect".

5.1.2.2.6. UDP Data Transfer

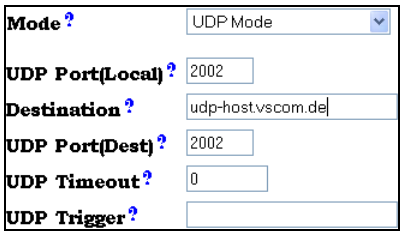


Image 28: Web Panel UDP Data Transfer

The UDP mode is available as a function since the version 1.4 of the firmware. UDP sends data in single packets instead of a stream. This protocol requires a "UDP Port(local)" for listening to incoming data. Other stations on the network send their data to this port. The "Destination" host is configured by IP-Address or name, plus the target "UDP Port(Dest)".
"UDP Timeout" defines when NetCom sends the received data as a UDP Frame. If the reception of serial data is interrupted for this time (in milliseconds), the data sampled so far is sent to the destination.
"UDP Trigger" defines a sequence of characters. As soon as this sequence is detected in the received data, all data up to the end of this Trigger is sent to the destination. In most situations such a Trigger includes control or other special characters. Enter them numeric: as \xHH where HH is the hexadecadic code of the character, or as \OOO where OOO is the octal code of the character. The backslash itself must be doubled as \\.

5.1.3. WEBBROWSER NETCOM TOOLS

Since Firmware version 1.6.0 the available tools are:

- The Ping utility to check if a station is available.
- Statistic information for each serial port.
- The Netstat utility to monitor used TCP connections.
- The option to update the firmware.
- Saving of Configuration to / Loading from a file.
- Syslog
- DebugLog

5.1.3.1. Ping

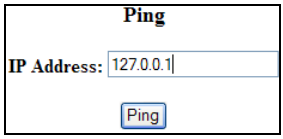
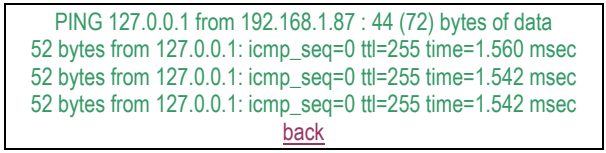


Image 29: Web Panel Ping

Enter the IP-Address or the name of a station in the field, and click the "Ping" button. The network connection is checked by sending certain ICMP data packages.


PING 127.0.0.1 from 192.168.1.87 : 44 (72) bytes of data
52 bytes from 127.0.0.1: icmp_seq=0 ttl=255 time=1.560 msec
52 bytes from 127.0.0.1: icmp_seq=0 ttl=255 time=1.542 msec
52 bytes from 127.0.0.1: icmp_seq=0 ttl=255 time=1.542 msec
back

If the target responds, the network between the NetCom and the target is operational. The time required for an echo depends on the speed of the network. In a typical Ethernet this is only very few Milliseconds, while it can be several seconds throughout the Internet.

5.1.3.2. Statistics

Image 30: Web Panel Statistics Port Selection

Select the serial port to see its statistical information.

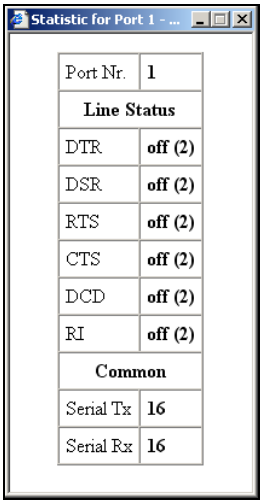


Image 31: Web Panel Port Statistics

The statistics window reports the state of the modem status and control signals. Also the number of state changes. The number of characters sent and received is shown at the bottom.

5.1.3.3. Netstat

Image 32: Web Panel Start Netstat

Use Netstat to see the actual connection status of NetCom. This is a standard tool for network debugging.

Update

```
Proto Local Address          Foreign Address        State
tcp   0.0.0.0:23             0.0.0.0:0              LISTEN
tcp   0.0.0.0:80             0.0.0.0:0              LISTEN
tcp   0.0.0.0:2000           0.0.0.0:0              LISTEN
tcp   0.0.0.0:2001           0.0.0.0:0              LISTEN
tcp   0.0.0.0:2010           0.0.0.0:0              LISTEN
tcp   0.0.0.0:2011           0.0.0.0:0              LISTEN
tcp   0.0.0.0:2020           0.0.0.0:0              LISTEN
tcp   0.0.0.0:2021           0.0.0.0:0              LISTEN
tcp   0.0.0.0:2030           0.0.0.0:0              LISTEN
tcp   0.0.0.0:2031           0.0.0.0:0              LISTEN
tcp   192.168.1.243:80       192.168.1.42:1280      TIMEWAIT
tcp   192.168.1.243:80       192.168.1.42:1281      ESTABLISHED
udp   0.0.0.0:161
udp   0.0.0.0:19970
udp   192.168.1.243:32331
```

Image 33: Web Panel Netstat Output

A “Foreign Address” of 0.0.0.0 is listed when NetCom is waiting for an incoming connection (`LISTEN`). If the value is not 0.0.0.0, the connection is either active (`ESTABLISHED`) or closed (`TIMEWAIT`).

5.1.3.4. Firmware

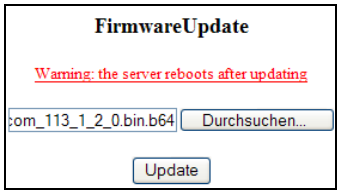


Image 34:
Web Panel Firmware Upload

To upload a new version of the firmware, put the name of the file in the field. Your webbrowser may allow to search for the file. Click on the "Update" button. While loading the file is checked. If it is valid, it is stored in the Flash Memory. When the upload is finished, NetCom will Reboot.

5.1.3.5. Save and Load Configuration

Image 35: Web Panel Save/Load Configuration

It is possible to save the actual configuration to a text file. This is first implemented in Firmware version 1.6. Of course it is also possible to load the saved configuration into a NetCom.

5.1.3.6. Logging and Debug

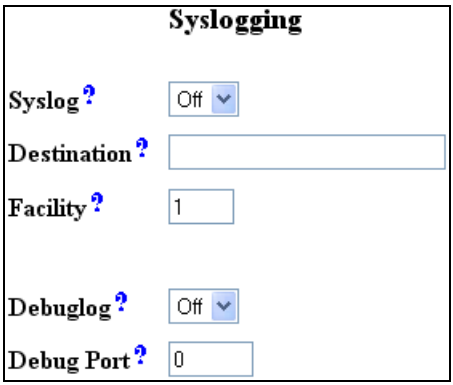


Image 36: Web Panel Syslog & Debug

Syslogging requires a server the information is sent to. Facility allows to select the data sent to that server.

For Debuglog the NetCom behaves as the server. Open a TCP connection to the configured port, and receive all information generated.

5.2. CONFIGURE WITH MANAGER PROGRAM

Shipped with the NetCom Devices there is a versatile program for Windows Operating System, named NetCom Manager. This program shall detect, manage and configure the NetCom Devices in your network. You can start it by several ways. First of all it is stored on the CD-ROM, named NETCOMMGR.EXE (NETCOMMGRNT.EXE on Windows NT). It is possible to start it directly from the CD-ROM.

Image 37: NetCom Manager

See this Icon to the left. When the Virtual Com Drivers are installed, there are more options to run the program. In Windows NT the same Icon appears in the Control Panel, to start the NetCom Manager program.

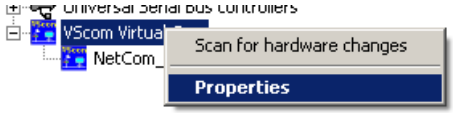


Image 39: NetCom Manager in Device Manager

Image 38: NetCom Manager in Start Menu

In Windows 2000, XP and 2003 Server the driver software installs a new device class "Vscom Virtual Com". The properties of the class open the NetCom Manager. Additionally the installation of the drivers created a new program group in the Start Menu.

This section of documentation focuses on management of the NetCom Devices. The options to configure driver-specific options of the serial ports are skipped here. This includes some buttons and panels. They are described in total below, in the documentation of the drivers and panels.

While in the configuration process, a click on a button or a double-click on an item opens properties or other options. In many situations, a right-click with the mouse opens context-sensitive options. Just try it out. The NetCom Manager is designed to help configure driver options. So for very detailed configuration of a NetCom, it is better to use the Webbrowser interface, or do it via Telnet. However, here are the options.

5.2.1. STARTING NETCOM MANGER

When NetCom Manager is started, it will "Search" the NetCom in your LAN. This process may take up to 30 seconds. The devices in a LAN

are typically found in the first seconds. If this is enough for you, you can stop the search by click on the “Done” button.

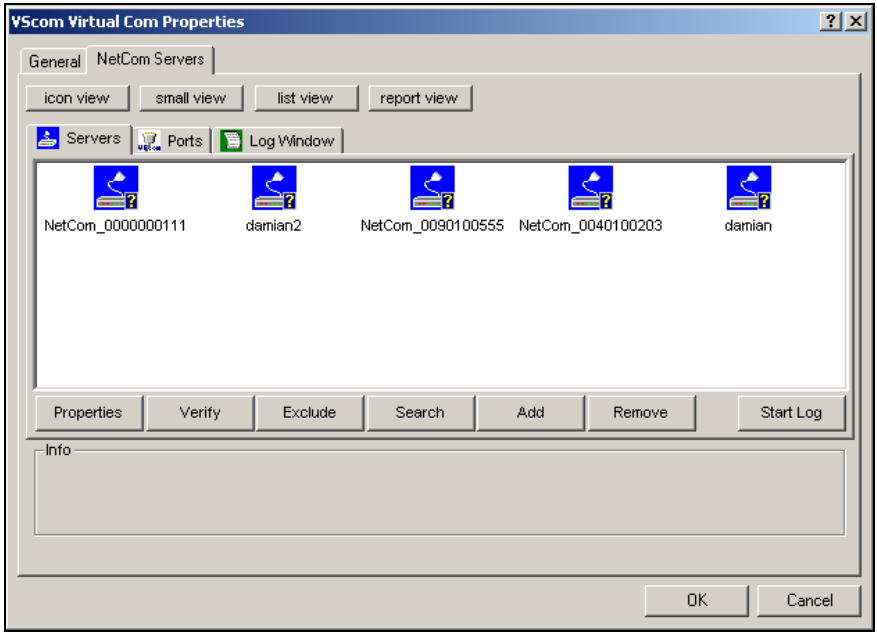


Image 40: NetCom Manager “Servers” Panel

The NetCom are listed here in the “Servers” panel. Since the “Search” uses broadcast mechanisms, the range is limited. If you have routers in your network, or you contact some NetCom via Internet, you must “Add” them manually. Enter the network parameters to access the NetCom.

Select a NetCom, and click on the “Properties” button, double-click the Icon, or use a right click. Using “Verify” the NetCom Manager contacts the NetCom to check if it is properly configured and online. “Exclude” is only useful in conjunction with the Virtual Com Drivers, so skipped here. “Search” repeats the search from the program start, and may be used at any time. “Remove” removes a server from this list. This option is most often used to clear old data from the drivers database. For monitoring purposes you may select a NetCom, and “Start Log” for this. It may be done for several Devices at the same time. The output is visible in the “Log Windows” panel.

5.2.2. NETCOM SERVER SETTINGS - INFO

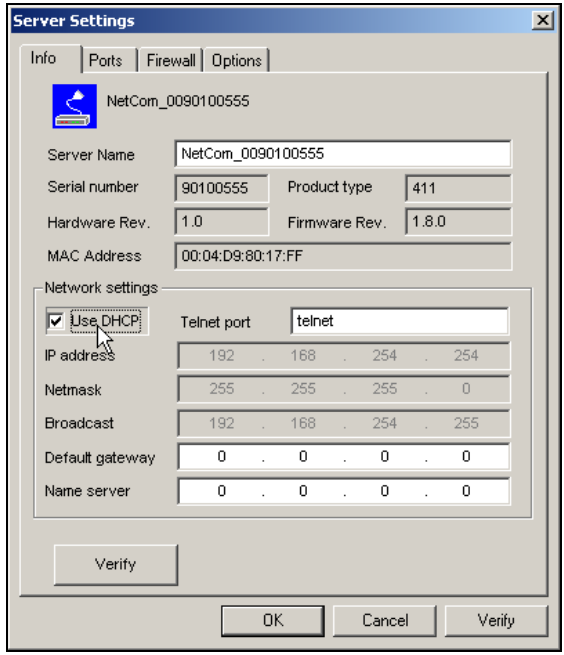


Image 41: NetCom Server Settings

As described above, open the "Properties" of a NetCom Device. The Server Settings start with the "Info" panel. Configure the options as your network requires.

The "Server Name" is just for information. As factory setting it inclues the serial number of the device. You may change it to any string, since there is no functionality related to the name. This name is listed in the Server panel of NetCom Manager. The next parameters are fixed, and displayed for information only.

The "Telnet port" allows to configure this NetCom via Telnet. The value is a TCP port. Factory setting is the standard port for Telnet, 23.

By default the NetCom is set to "Use DHCP" for automatic configuration of IP parameters. This is the suggested method. However there are several situations where this option can not be used. In this case deactivate it. When inactive, other parameters may be changed.

The basic parameters "IP address" and "Netmask" are mandatory. If any of these is changed, the NetCom Manager calculates a matching address for "Broadcast". You may also change this address.

The DHCP option will also configure the "Default gateway" and the "Name server". Without DHCP you must enter these parameters by

yourself. However they are not required in all configurations. So enter 0.0.0.0 if they are not used.

5.2.3. NETCOM SERVER SETTINGS - PORTS

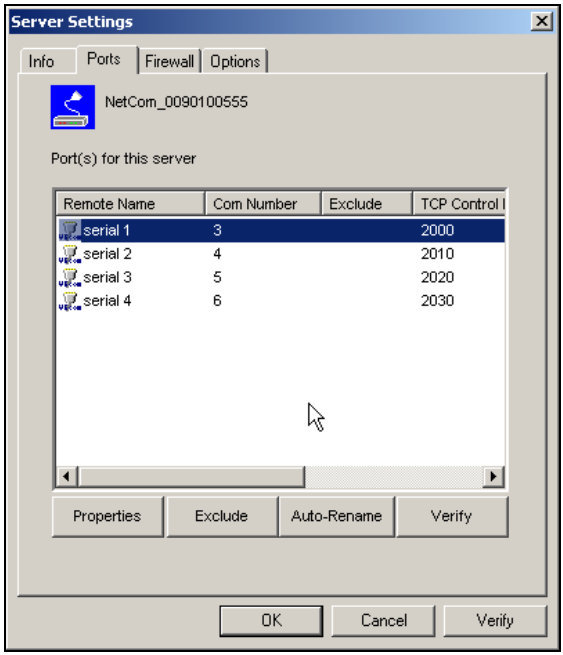


Image 42: NetCom Ports Panel

The “Ports” panel lists all serial ports of a NetCom. Some of the options are driver related, e.g. the “Com Number”. Each serial port may operate via three TCP ports. The “TCP Control Port” is used in the Virtual Com Driver mode, and also in Null-Modem Tunnel. If Driver mode is not desired, this parameter is ignored almost always.

The “TCP Data Port” is used to transmit data to and from the serial port. Use the default, or change the value to the settings required for your network. There is also a “UDP Data Port”, used in packet data transfer. You can not switch the NetCom to UDP mode with the Manager. But if it is already in this mode, you can change this basic parameter.

5.2.4. NETCOM SERVER SETTINGS - FIREWALL

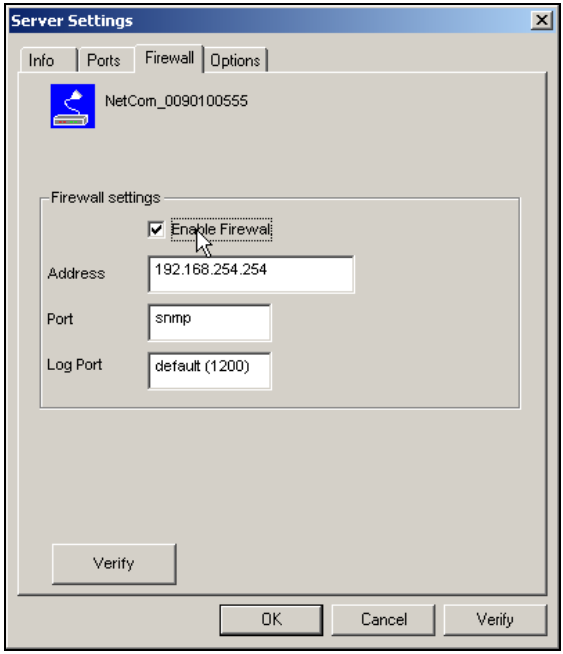


Image 43: NetCom Firewall Panel

Many networks use a Firewall to protect the stations in the network from other networks, including the Internet. In some situations the contact to a NetCom must pass through such a Firewall. To do this you must "Enable Firewall", and enter the "Address" of the Firewall.

The Manager configures a NetCom via SNMP. The Firewall must have a special "Port" to receive those data, and to transfer it to the internal network. Enter this port.

The same scheme applies to the logging option. By default a NetCom listens on port 1200 for logging connections. The Firewall must also have a special "Log Port" to receive this connection, and to transfer it to the NetCom.

5.2.5. NETCOM SERVER SETTINGS – OPTIONS

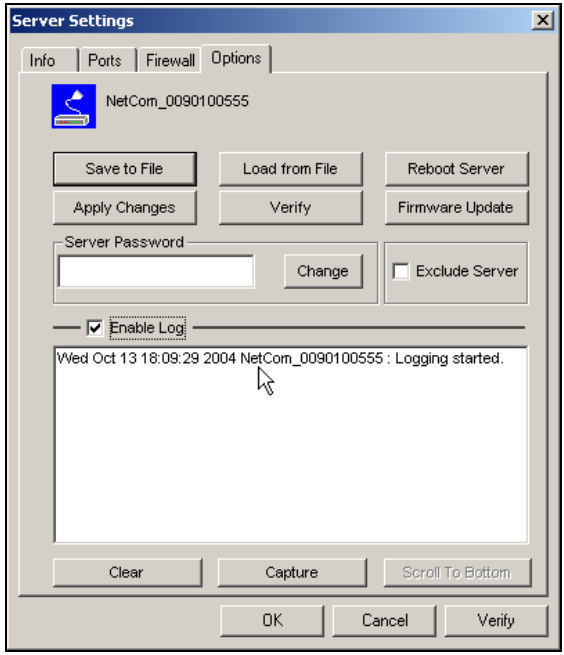


Image 44: NetCom Options Panel

This Panel is available since software version 1.4.8.0, in this enhanced version. A “Safe to File” of the configuration is available, as well as the opposing “Load from File” of this data.
You can also “Reboot” the NetCom. This may be useful, e.g. if an old connection blocks access to the NetCom.
The button “Apply Changes” commits all parameter settings done so far to the NetCom. And the “Verify” checks the current settings by reloading the status from the NetCom to the Manager program.
When you want to install a “Firmware Update”, use this button.
The NetCom may be protected for access, in this case you must place the current “Server Password” in the dialog. The option to change the password is reserved for a future extension. “Exclude Server” is related to the Driver installation only.
You may “Enable Log” to see events at the NetCom, for monitoring. If enabled, the log will also appear in the central “Log Window”. At any time it’s possible to “Clear” the log, or “Capture” the data to a file.

5.3. CONFIGURE NETCOM VIA TELNET CONSOLE

There are many situations, when using the NetCom Manager program for Windows is not appropriate. And a graphical Webbrowser may also be unavailable. To enable configuration also in this situation, there is the Telnet option. It is preferred by many users.

To connect your Telnet session you need the IP-address of NetCom. Also you must be able to communicate with NetCom via IP. If you can send a PING to NetCom and receive an Echo, the configuration is fine. This requires a predefined NetCom, maybe via a DHCP server. You may also use the NetCom Manager Program (on a different computer) to find the IP-Address of the NetCom. Start your Telnet program, set it to use a terminal emulation of VT100. This is recommended, but VT52 is also possible. The Telnet session is closed by the NetCom, when no user input occurred for at least 3 minutes.

In your Telnet, establish a connection to the NetCom. If the configuration port is changed from the default 23 for Telnet, use this port. If the NetCom is password protected, you need to enter the password right now.

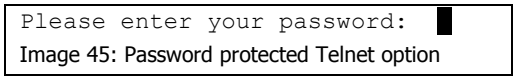


Image 45: Password protected Telnet option

When connected to NetCom you must define the type of terminal used.

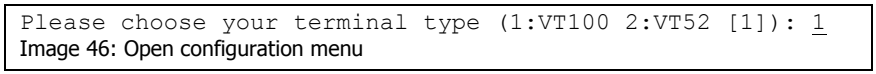


Image 46: Open configuration menu

5.3.1. TELNET MAIN MENU

The configuration with Telnet is menu-driven.

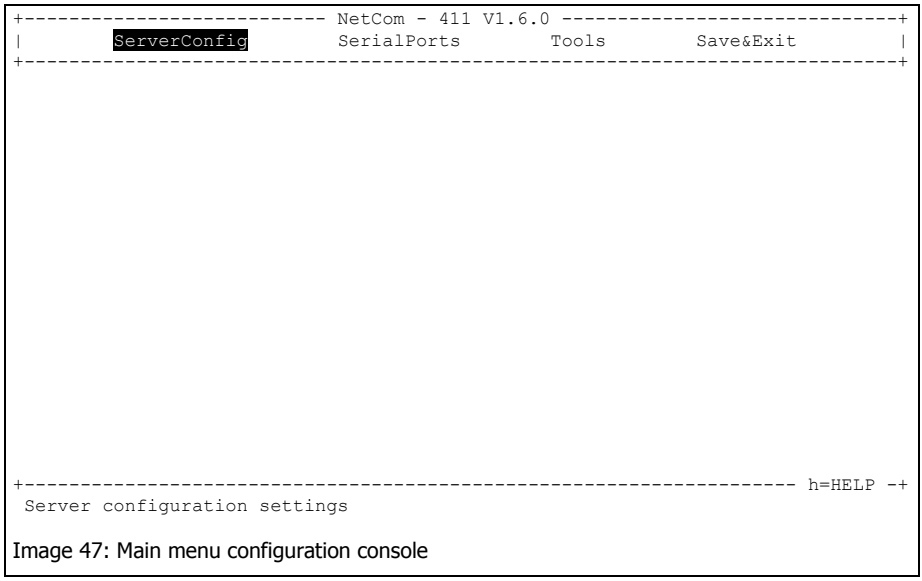


Image 47: Main menu configuration console

This is the start point for configuration. “ServerConfig” has all options to configure the NetCom device itself, including the IP-Parameters to access it. “SerialPorts” defines settings related to the serial port. “Tools” has some utilities like PING or displays statistics. In “Exit” you may leave the menu or reboot the NetCom.
At any time you can get a short hint by typing “H” for help.

5.3.2. SERVER CONFIGURATION MENU

5.3.2.1. Parameter

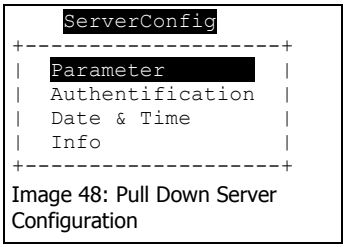


Image 48: Pull Down Server Configuration

Selecting “Parameter” brings up all Network configuration items, listed below.

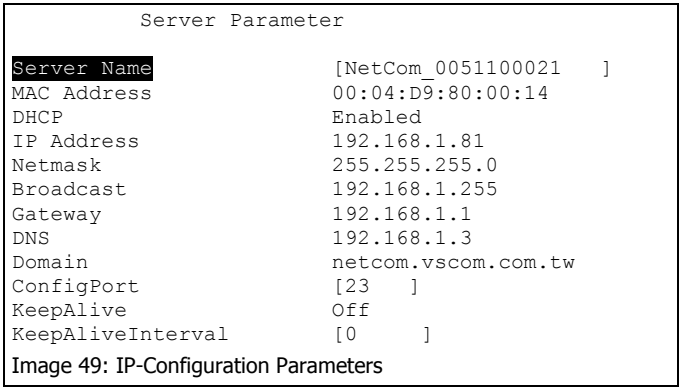


Image 49: IP-Configuration Parameters

Use the cursors to select the parameter you want to change. Hit <Enter> to go in edit mode. Type the new value.

“Server Name” identifies the device when the driver software searches for devices; this will help you find the correct NetCom server.

DHCP is for automatic IP configuration. “IP Address”, “Netmask” and “Broadcast” are parameters you get from your network administrator. Same applies to “Gateway”, “DNS” and “Domain”. The “ConfigPort” is 23 by default, which is standard for Telnet. You should only change it if you have strong reasons.

”KeepAlive” is the TCP-intrinsic function of connection checking. The related interval is defined in seconds.

5.3.2.2. Authentication

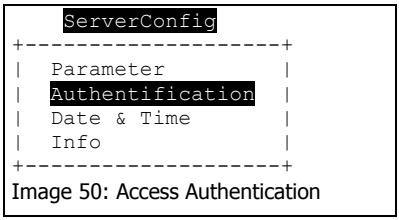


Image 50: Access Authentication

This menu allows to enter a password. This password is later required to get access to NetCom. It is also possible to leave the password empty.

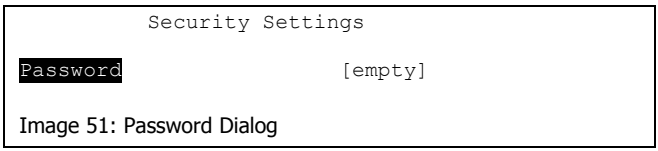


Image 51: Password Dialog

5.3.2.3. Date & Time

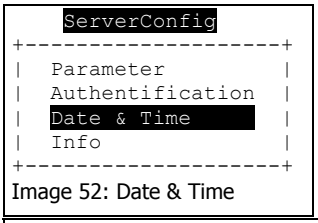


Image 52: Date & Time

Since Firmware version 1.6 the NetCom can retrieve actual date and time from a specified server.

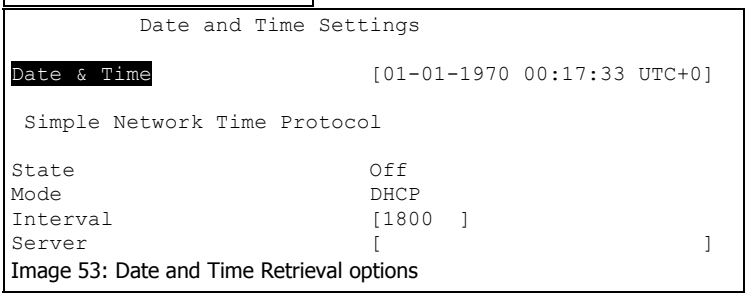


Image 53: Date and Time Retrieval options

Retype the value of “Date & Time” for manual setting. The format is MM-DD-YYYY HH:MM:SS UTC+/-TZ (Time Zone)

The “State” field has three possible settings:

- “Off”: disables automatic time retrieval.
- “Startup”: NetCom gets the time at reset or power on.
- “Interval”: NetCom repeats to retrieve time.

The “Mode” field allows to decide how to configure the time server. It is either possible to get the server by DHCP, or direct specified. The “Interval” defines how often the NetCom retrieves the time from the “Server”.

5.3.2.4. Info

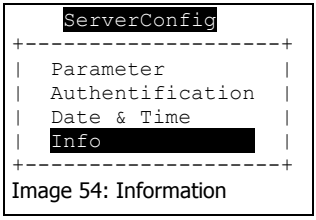


Image 54: Information

Info brings up general information about the device.

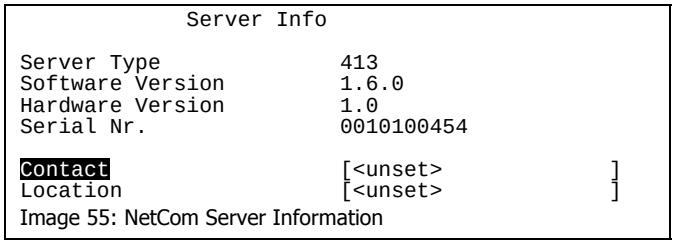


Image 55: NetCom Server Information

This dialog displays some basic information about the installed NetCom server. The Administrator may provide some contact information here. “Contact” defines a person to contact for help, e.g. “Mrs. Jane Doe, 555-HELP”. “Location” is the physical place of the NetCom, e.g. “CeBIT Hall 12, Service Box IX.a”.

5.3.3. SERIAL PORTS MENU

The settings available in this menu are by port. Therefore, first the port to configure has to be chosen.

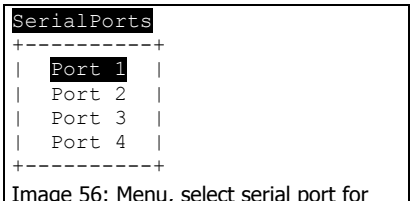


Image 56: Menu, select serial port for configuration

Just select the port by placing the cursor, and then press <Enter>.

5.3.3.1. Communication Parameters

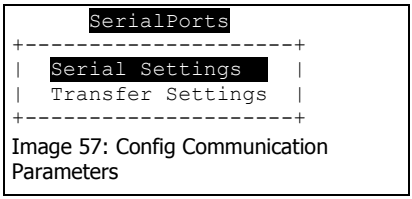


Image 57: Config Communication Parameters

These settings come in effect in the case of the Raw connection type; i.e. if the Driver Mode is not used. The driver will configure the parameters as the application requested it.

The parameters are organised in two groups. The “serial settings” define the basic behaviour of the serial port. And the “Transfer Settings” configure the operation mode of NetCom on the network. Each serial port is configured separately, there is no setting shared between ports.

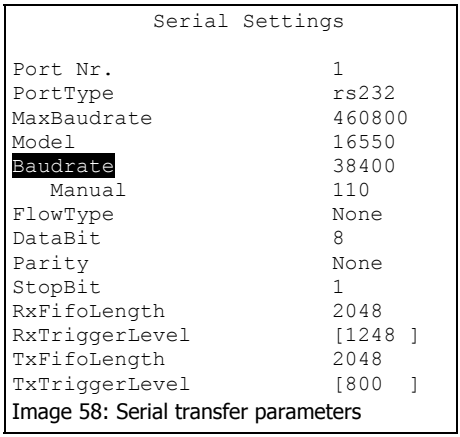


Image 58: Serial transfer parameters

Many standard options to use with all serial ports. The maximum serial speed is visible. You may configure the serial transmission by setting “Baudrate” from a defined list. If you select Manual in this list, you may enter it numeric below. If the selected value is not possible, an error is displayed. Also configure character size, parity mode and the length of the stop bit.

The settings of “RxTriggerLevel” and “TxTriggerlevel” define when NetCom issues a “buffer empty/full” message. If the values are less than 16, they have direct impact on the handling of the serial port hardware FIFO. Also, if you change the UART “Model” to 16450, the FIFO size is configured to support a single Byte. This option reduces latency times, by increasing the network traffic.

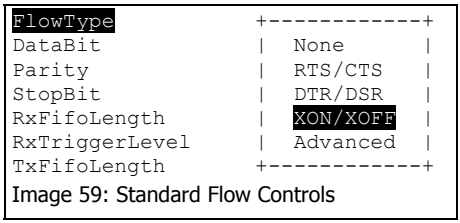


Image 59: Standard Flow Controls

FlowType opens a submenu of configurations. Handshaking is available via Standard XON/XOFF or RTS/CTS. Also possible is the use DTR/DSR. There is also an Advanced option for detailed and customer specific configuration.

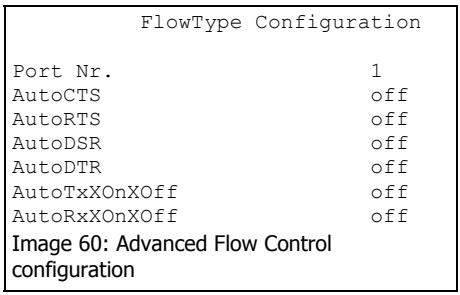


Image 60: Advanced Flow Control configuration

This Advanced allows to configure the flow control in a special menu. Every combination for incoming and outgoing flow control may be defined with this option.

5.3.3.2. Data Transfer Modes

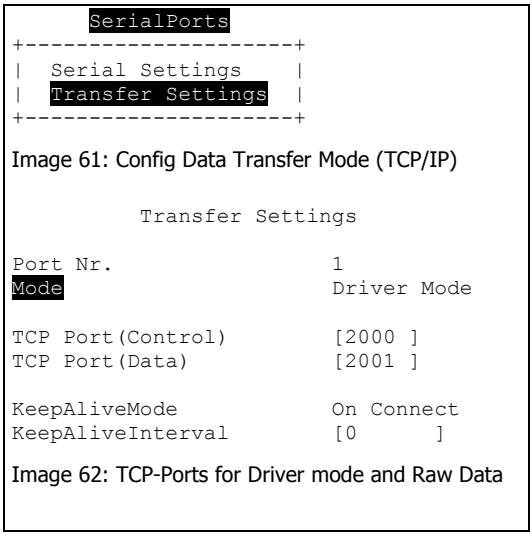


Image 61: Config Data Transfer Mode (TCP/IP)

Image 62: TCP-Ports for Driver mode and Raw Data

These are TCP/IP parameters. The TCP Port for "Data" transfers the serial data, while the TCP Port for "Control" transfers the control information defined by the VS NetCom driver, if installed. Programs operating in Raw TCP mode (like Telnet) connect to the "Data" port for data transfer.
Since there are more transfer modes (listed below), all parameters are explained at the "Advanced Settings".

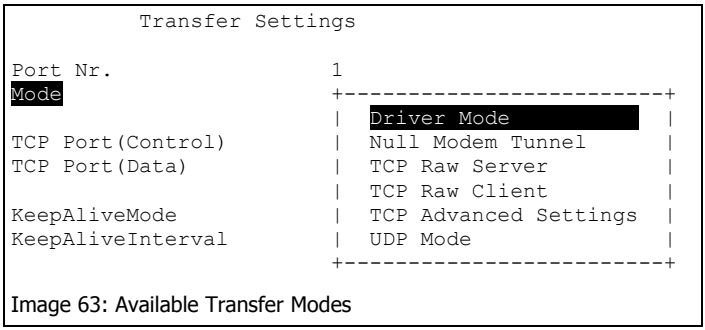


Image 63: Available Transfer Modes

To change the current "Mode" of the serial port, place the cursor on the field and hit enter. A drop-down list of the available modes appears.

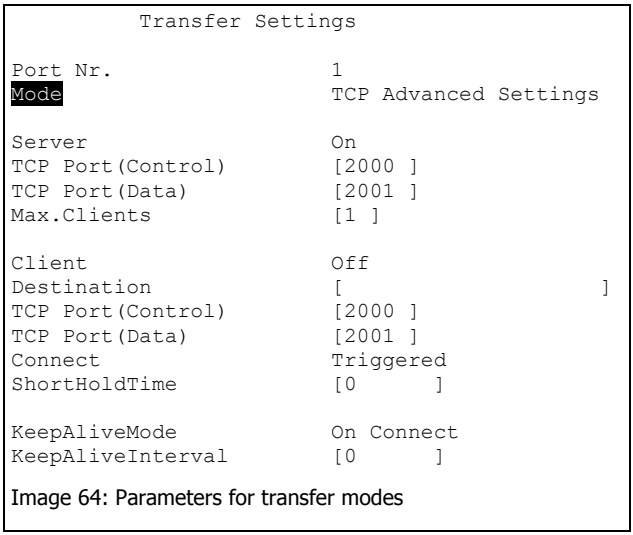


Image 64: Parameters for transfer modes

For demonstration purposes the "TCP Advanced Settings" mode is selected. All parameters may be changed. This allows some unexpected configurations.
Here this is used to show and explain all parameters and their purposes.
Information is also available On-Screen when typing help.

NetCom usually acts as a network server. This means it accepts incoming connections. The most used Driver Mode is explained above. It is possible to disable this option by setting "Server" to `Off`. Usually there is only one client connection at a time, but the limit can be raised.

NetCom can also operate as a network client, but in most installations it does not. This is enabled by setting "Client" to `On`. In certain situations NetCom contacts a computer (server) defined by "Destination" to send data. Most customers just need a Raw TCP connection to the server. The target application is defined by the "TCP Port(Data)". If the server is another NetCom, both devices can also exchange control information via the "TCP Port(Control)". There are two types of "Connect", `Permanent` and `Triggered`. In Permanent mode NetCom connects to the server immediately. If the connection is interrupted for some reason NetCom keeps trying until it is established again. In Triggered mode NetCom connects to the server when data arrives on the serial port. When no more data arrives, "ShortHoldTime" (in milliseconds) defines how long to keep the connect before closing it. *Warning*: a time shorter than 1000 may cause problems.

NetCom can monitor an open connection. This is controlled by the "KeepAliveMode", which has three settings: `Off`, `On Connect` and `Polling`. Please note, this option is effective only in Driver Mode and Null Modem Tunnel. If the Keep Alive function is required in the other modes, the global option in Server Parameters is available.

- `Off`: no KeepAlives
- `On Connect`: when a client is trying to connect to the server and there was a connection before, the server checks if the first connection still exists. If it does not exist anymore, the server accepts the new connection
- `Polling`: the server checks in "KeepAliveInterval" (seconds), if a connection still exists.

There are predefined modes usable as compact configuration options. Listed and described below.

5.3.3.2.1. Driver Mode

In Driver Mode NetCom operates as a server. It accepts connections on the Data and the Control port. Both must origin on the same computer, this is checked. The parameters for Keep Alive apply in driver mode. Only a single client computer is allowed at a time. The Control port set to zero is TCP Raw Server.

```
Mode                        Driver Mode

TCP Port(Control)           [2000 ]
TCP Port(Data)              [2001 ]

KeepAliveMode               On Connect
KeepAliveInterval           [0      ]
```

Image 65: Driver Mode parameters

5.3.3.2.2. TCP Raw Server Mode

```
Mode                        TCP Raw Server

TCP Port(Data)              [2001 ]
Max.Clients                 [1 ]
```

Image 66: TCP Raw Server parameters

The NetCom also operates as a server in this mode. It only accepts raw data connections to the Data port (this is also possible in Driver Mode). In Raw Server mode multiple clients may connect. Serial data received is sent to each client, all clients can send data. The customers application is responsible to avoid data confusion and damage.

5.3.3.2.3. TCP Raw Client Mode

```
Mode                    TCP Raw Client

Destination             [                    ]
TCP Port(Data)          [2001 ]
Connect                 Triggered
ShortHoldTime           [0      ]
```

Image 67: TCP Raw Client parameters

In Raw Client Mode the NetCom is a network client. Under defined conditions it contacts a server to send and receive data. The server is defined by Destination and TCP Data port. The Connect modes and Short Hold Time apply. This configuration is often used, when a single computer must monitor several stations, and these rarely send data.

5.3.3.2.4. Null Modem Tunnel

```
Mode                    Null Modem Tunnel

Server
TCP Port(Control)       [2000 ]
TCP Port(Data)          [2001 ]

Client
Destination             [                    ]
TCP Port(Control)       [2000 ]
TCP Port(Data)          [2001 ]
ShortHoldTime           [0      ]

KeepAliveMode           On Connect
KeepAliveInterval       [0      ]
```

Image 68: Null Modem Tunnel parameters

This is a special mode. Two NetComs connect via network and simulate a long Null Modem cable between the two serial ports. This mode is symmetric, both NetCom operate as server and as client at the same time.

The server part operates in Driver Mode and waits for incoming connections. Serial data is transmitted, but also control and status signals on the serial port.

The client part waits for events on the serial port. Received data or a change of status signals causes a connect. The destination NetCom is defined by IP-Address and the two TCP ports for Control and Data. A permanent connection is available via the TCP Advanced Settings.

5.3.3.2.5. UDP Mode

UDP is an Internet Protocol, which does not define a connection. There is no extra data to signal a successful transmission. As a side effect data may be sent and received faster than with TCP/IP. UDP is available since Firmware version 1.4.0

```
          Transfer Settings

Port Nr.          1
Mode              UDP Mode

UDP Port(Local)   [2002 ]
Destination       [                ]
UDP Port(Dest)    [2002 ]
UDP Timeout       [0      ]
UDP Trigger       [                ]
```

Image 69: UDP Mode parameters

Please compare with the parameters for TCP Raw Server and Client Modes. The parameters to configure the UDP Mode are similar to a mixture of these modes.

Since there is no connection as in TCP/IP, it is required to configure the NetCom to receive data via UDP. The only parameter required is the local port number. To define where to send the data NetCom needs the Destination, and the port to address there. Since there is no connection, data can not be sent in a stream. UDP uses packages. There are several ways to define the content for a package. "UDP Timeout" (given in Milliseconds) is an interval. If no serial data is received for this time, all data available so far is sent as a package. A value of zero causes all data to be sent immediately.

"UDP Trigger" defines a sequence of characters. As soon as this sequence is detected in the received data, all data up to the end of this Trigger is sent to the destination. In most situations such a Trigger includes control or other special characters. Enter them numeric: as \xHH where HH is the hexadecadic code of the character, or as \OOO where OOO is the octal code of the character. The backslash itself must be doubled as \\.

5.3.4. TOOLS MENU

5.3.4.1. Ping

```
    Tools
+-------------+
|  Ping       |
|  Statistic  |
|  Netstat    |
|  Logging    |
|  Firmware   |
+-------------+
```

Image 70: Tools menu

The Ping tool allows for verification of network settings. Try to reach some hosts in your local network.

```
IP-Address to ping to:   [192.168.1.42        ]
```

Image 71: Ping test utility

5.3.4.2. Statistics

```
    Tools
+-------------+
|  Ping       |
|  Statistic  |
|  Netstat    |
|  Logging    |
|  Firmware   |
+-------------+
```

Image 72: Statistics for serial ports

```
Tools
+----------+
|    Port  1    |
|    Port  2    |
|    Port  3    |
|    Port  4    |
+----------+
```

The Statistics are presented on a by-port base. So you first select the serial port, and then you have the information about modem status and control. Also the amount of data transferred is shown.

```
                Line Status

DTR                          off  (0)
DSR                          off  (0)
RTS                          off  (0)
CTS                          off  (0)
DCD                          off  (0)
RI                           off  (0)

                   Common

Serial Tx                    0
Serial Rx                    0
```

Image 73: Status and Statistics

Netstat

Netstat is a common tool to display the actual status of network connections. It may be used to monitor the actual status of the NetCom.

```
    Tools
+-------------+
|  Ping       |
|  Statistic  |
|  Netstat    |
|  Logging    |
|  Firmware   |
+-------------+
```

Image 74: Netstat analysis

This is a sample result of Netstat. When there is more to display, it will start with "1/2" in the first line. Or even more for a long list. You may change to a different page by using the

```
1/1
     Proto Local Address          Foreign Address        State
     tcp   0.0.0.0:23             0.0.0.0:0              LISTEN
     tcp   0.0.0.0:80             0.0.0.0:0              LISTEN
     tcp   0.0.0.0:2000           0.0.0.0:0              LISTEN
     tcp   0.0.0.0:2001           0.0.0.0:0              LISTEN
     tcp   0.0.0.0:2010           0.0.0.0:0              LISTEN
     tcp   0.0.0.0:2011           0.0.0.0:0              LISTEN
     tcp   0.0.0.0:2020           0.0.0.0:0              LISTEN
     tcp   0.0.0.0:2021           0.0.0.0:0              LISTEN
     tcp   0.0.0.0:2030           0.0.0.0:0              LISTEN
     tcp   0.0.0.0:2031           0.0.0.0:0              LISTEN
     tcp   192.168.1.98:23        192.168.1.42:3665      ESTABLISHED
     udp   0.0.0.0:161
     udp   0.0.0.0:33320
     udp   192.168.1.98:10397
```

Image 75: Sample Netstat output

Page Up/Down keys in your Telnet. The display is refreshed in an interval of some seconds. Use ESC key to return to the menu.

5.3.4.4. Logging

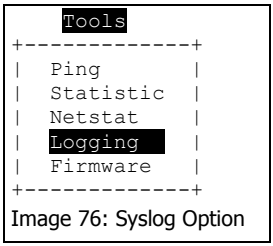


Image 76: Syslog Option

Since firmware version 1.6 the NetCom has two options of Logging. There is the standard Syslog, and a second option of logging via Telnet.

Activate the Syslog, and define the machine with the Syslog Demon running. Also configure the Facility parameter.

You may also connect to a special "Debug Port" on the NetCom to get all messages in realtime.

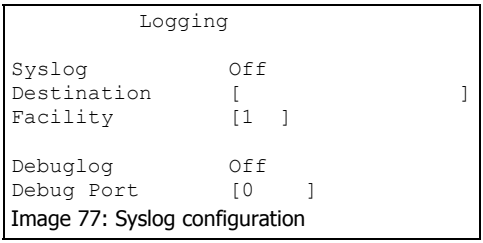


Image 77: Syslog configuration

5.3.4.5. Firmware

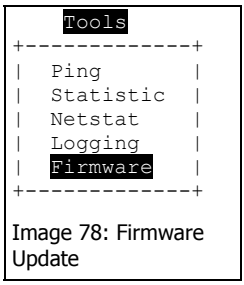


Image 78: Firmware Update

There is an option to upgrade the Firmware of NetCom. This is either done via the actual channel (i.e. the serial or Telnet connection). Or independently via a separate TCP/IP connection. This setting defines the parameter. The Firmware is sent coded in base64, via very simple programs like a second Telnet session, or similar tools.

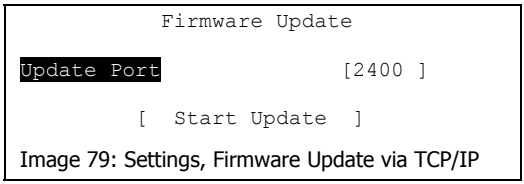


Image 79: Settings, Firmware Update via TCP/IP

5.3.5. SAVE&EXIT MENU

5.3.5.1. Save Parameter

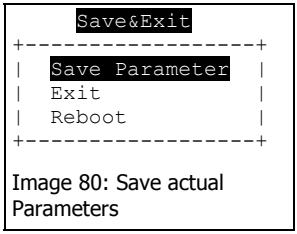
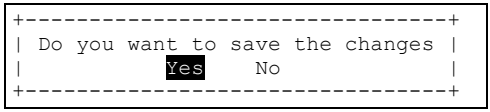


Image 80: Save actual Parameters

When some changes are done, it is possible to save these modified settings here. Confirmation is requested before doing this.



5.3.5.2. Exit

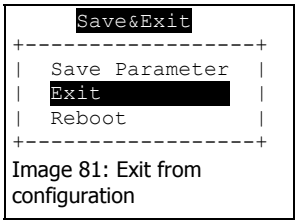


Image 81: Exit from configuration

You will not be surprised, when you leave the menu by selecting this option. If you made any changes of parameters, you must confirm to save these.

5.3.5.3. Reboot

You also leave the menu here. But the NetCom is restarted. This activates any changes in the settings. This reboot is necessary for some changes like IP configuration. Others do not require a reboot. Also here, if parameters are changed during the session, confirmation for saving them is requested.

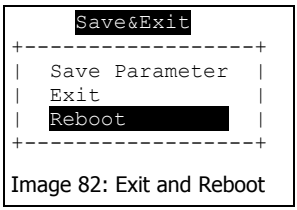


Image 82: Exit and Reboot

5.4. CONFIGURE NETCOM VIA SERIAL CONSOLE

In some situations it may be impossible to get network access to the NetCom Device. If this happens (e.g. by an accidentally misconfiguration), neither Telnet, nor the webinterface is functional. It may be even impossible to use the NetCom manager program.

In this case you must you must connect to the NetCom via the serial port. Disconnect any serial cable from NetCom. Set the DIP-Switches of port 1 to "RS-232 Configuration", all switches to Off. Then connect the NetCom with your computer using a standard modem cable (direct connection). If you do not have a modem cable, use a Null Modem cable and plug the Null Modem adaptor to the serial port. On NetCom 211 or the rackmount versions you need a Null Modem cable anyway.

Open any serial terminal program (Hyperterminal, minicom, …), select 38400 bps, 8 Bit, No Parity as configuration. Set your terminal to emulate a VT 100 (recommended, but VT52 is also possible), including the Arrow keys.

When connected to NetCom you must define the type of terminal used. This is the same configuration option as described above in 5.3.1 Telnet Main Menu.

6. THE VIRTUAL COM DRIVER

If properly configured, the serial ports of the NetCom Devices appear as virtual serial ports in your computer. The “virtual” means, there is no real hardware related to the serial port. However the driver offers the full functionality of a serial port to the system. The interface used by the driver is VCOMM, which in turn is supported by the Windows API. So Windows does not see a difference to Com1, and also no application should detect the change.

This section of the manual covers the correct installation of the drivers and serial ports. Please do a quick review of the section 4 Windows Driver Quick Installation, before reading further.

6.1. INSTALLATION OF NETCOM SERVERS

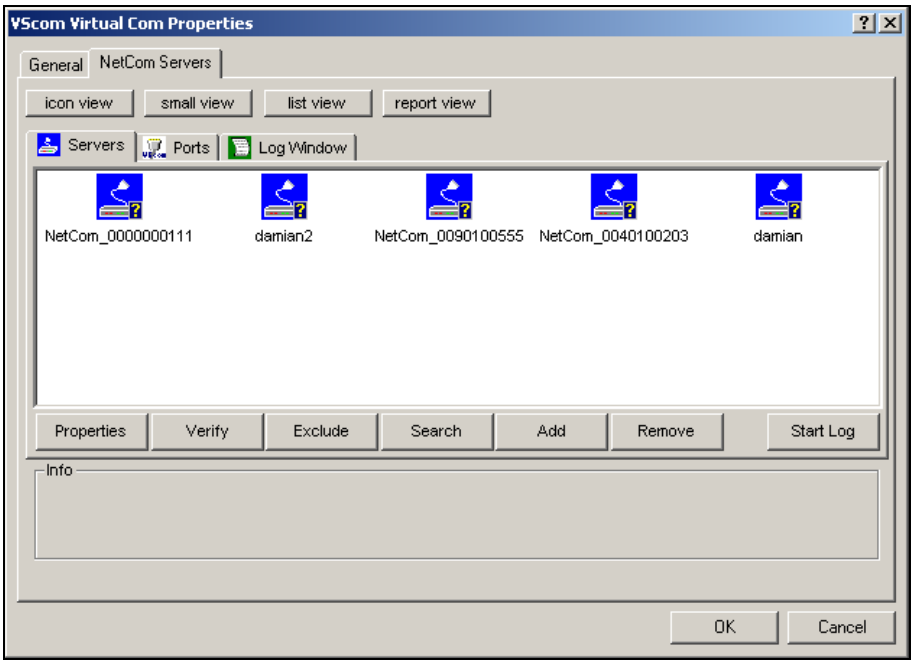


Image 83: Select NetCom to install

The NetCom Manager program is started by the Installation Wizard. Often there are more than only one NetCom listed. And sometimes not all of them are to be used on this specific computer.

Image 84:
Excluded NetCom

The “Exclude” button is used for that purpose. Select a NetCom Device, and click on that button. The driver will later ignore this NetCom, when installing and operating the serial ports. The Icon changes to olive color.

In “Image 83: Select NetCom to install” above you’ll notice yellow questions marks at each icon. These appear when the NetCom is not already installed for the Virtual Com driver. It may also appear, if you open NetCom Manager without administrative privileges. If the mark changes to a red exclamation mark, the NetCom is non functional. It may be without power, the network may be broken, or the device is completely removed. To clear the display in NetCom Manager just use the “Remove” button.

If a NetCom has not been operational when the Manager program was started, it is either displayed with the exclamation mark, or not displayed at all. You may make it operational be connecting it now. To install it, use the button “Search” to find it in the network now. Or “Add” it manually with that button.

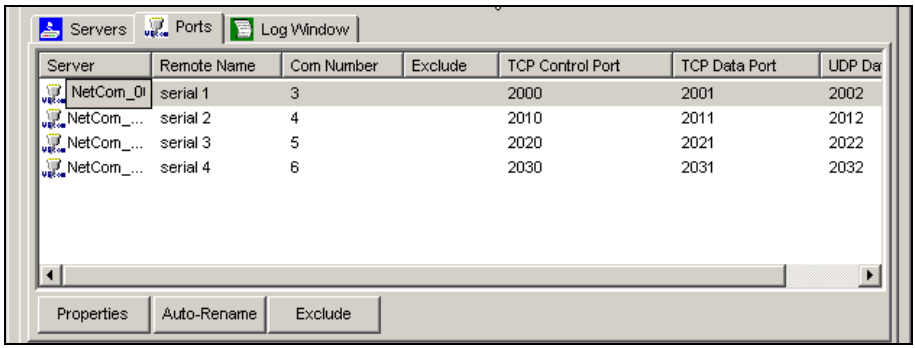


Image 85: NetCom Manager Ports View

Similarly you may exclude certain ports on a specific NetCom Server from installation as a Virtual Com port.

These are the special options used while installing the driver software. At any time after installation the configuration may be changed by the NetCom Manager program. This may result in serial ports appearing in or vanishing from the system.

6.1.1. CHANGING THE INSTALLATION

There are common situations, when the current configuration needs a change. In the first case the NetCom has been moved to a different location, or the logical structure of the network has changed. It may happen the IP-Address of NetCom is also changed. Either by Automatic (DHCP), or manually via a different interface like the Webbrowser. Because of the changed address the driver does not find the serial port to contact. Now open the NetCom Manager. It will re-detect the devices. In this process the Manager finds the already installed NetCom, but with a new configuration. Then the Manager requests interaction from the user. This question here assumes the NetCom shall be installed from scratch. This will produce a Com port with a new number. If just a reconfiguration occurred, click on "No". When you do that, the parameters of the installed Virtual Com are changed to contact the same serial ports on a new network address.

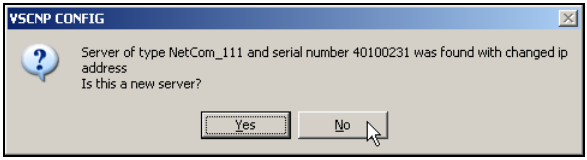

VSCNP CONFIG
Server of type NetCom_111 and serial number 40100231 was found with changed ip address
Is this a new server?
Yes
No

Image 86: Reconfigured NetCom found

The second case occurs, when a NetCom is replaced by another device. This new device shall have the same configuration, especially the same IP-Address. When you start the NetCom Manager, it will detect a new device with parameters already in the database. So a similar question appears. An installation of a new serial port is assumed again. If the device shall replace the old one, Click on the "No" button.

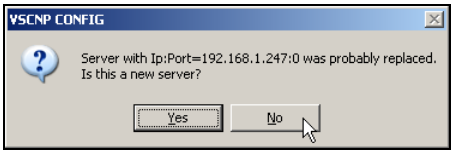


Image 87: Replaced NetCom found

In general the driver software and the NetCom Manager identify the NetCom Devices by the combination of IP-Address and serial number. If one of these is changed, the above requests appear.

6.2. CONFIGURE THE SERIAL PORTS

When the serial ports are installed by the Virtual Com driver software, any application may use them. In the Device Manager they appear as "NetCom COM Port" (Image 8: NetCom in Device Manager). Without special tests a program does not see a difference between Com1 and virtual Com7. For example the HyperTerminal program has no problem to communicate through these Virtual Com. And this situation is common amongst most programs.

A typical application selects a serial port, and opens it. After that it performs the standard configuration of bits per character, parity settings and number of stop bits. Also the flow control (handshaking) is defined by the application. Windows sends these requests to the port driver, and this driver sends the requests to the serial port on the NetCom.

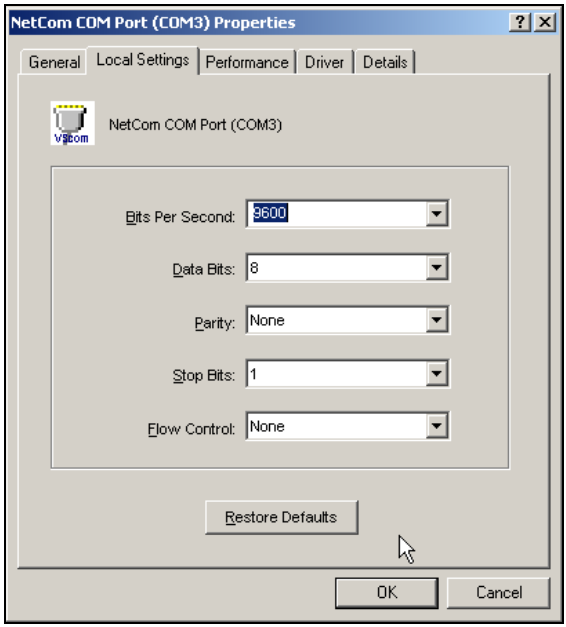


Image 88: NetCom COM Port Serial Settings

The same parameters may be pre-configured in the Device Manager. This is done via the "Properties" of the "NetCom COM Port". In the "Local Settings" tab these standard parameters are defined. Since most programs configure these parameters by themselves, the values are very rarely used. A typical situation is a serial printer attached to this virtual port.

As usual this behaves different in Windows NT. There is no Device Manager. To change these standard parameters, open the “Ports” applet in the Control Panel.
However it is suggested you open the new “NetCom Manager” applet instead. Change to the “Ports” view as in Image 85: NetCom Manager Ports View. Double-click on the small icon at the left side. In this dialog go to the “Local Settings” tab, as seen above.

6.3. PERFORMANCE ISSUES

However operation through the network causes some extra time, which is approximately 5 Milliseconds. With a port internal to the computer this time may be just some 100 Microseconds. This has an impact on reaction times. Some data protocols may be sensible. A lot of configurations are possible to compensate for this. But these have an effect on the sheer data throughput of the virtual serial port.

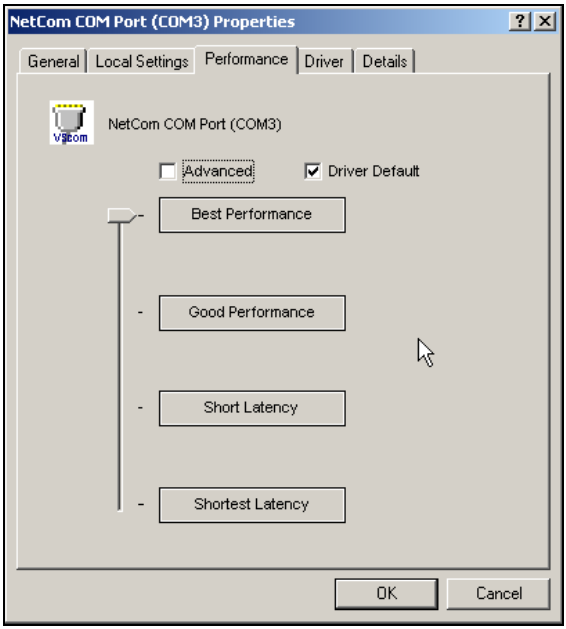


Image 89: NetCom COM Port Performance Settings

Consequently the configuration starts on the “Performance” tab. There are four already defined sets of parameters. The default configuration is for “Best Performance”. The driver software and the NetCom communicate with big data blocks. As a result a reaction on short events on the serial port is somehow delayed. For applications operating

with short data blocks, and waiting for short answers this is not optimal. It causes transmission delays, called Latency.
In three steps the Latency may be reduced, at the cost of reduced throughput for large data blocks. The fastest setting “Shortest Latency” is often referred to as “deactivate the FIFO”. The FIFO on the serial ports is not really deactivated, because this raises the risk of data loss. But the port is configured as if the FIFO is off, hence gaining in best reaction times. Use the ”Driver Default” to get the standard setting.
Use “Advanced” to get access to detailed configuration.

6.4. NETWORK & MISC PROPERTIES

When you use the “Advanced” checkbox on the “Performance” tab, the “Network & Misc” tab opens automatically.

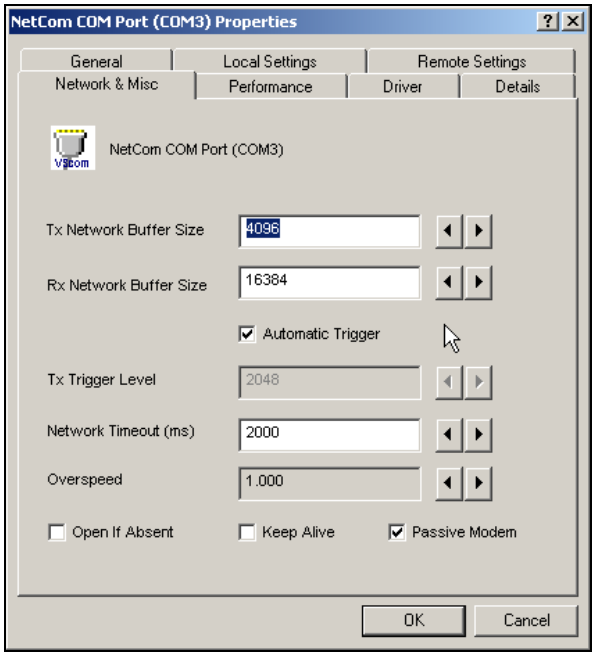


Image 90: NetCom COM Port Network & Misc Properties

The parameters on this tab control the operation of the driver software on the computer.

“Tx Network Buffer Size”: If the application sends small chunks of data to the driver, these are buffered to send them in one large packet. This defines the size of the buffer. And also the maximum packet size sent to the serial port by the driver software.

“Rx Network Buffer Size”: This is the size of the buffer to receive data from the NetCom.

“Automatic Trigger”: based on internal rules, this checkbox selects a best practice value for “Tx Trigger Level”. Deactivate it to control that parameter manually.

“Tx Trigger Level”: Controls the time when data is sent to the NetCom. If the Tx buffer holds at least this amount of data, the driver immediately sends them. If there is less data, the driver uses a timeout to determine when to send them.

“Network Timeout (ms)”: This is the timeout.

“Overspeed”: This is a special option, not really related to network communication. There are old applications, limited in the maximum speed. With Overspeed you define a multiplier. The baudrate requested by the application is multiplied with this factor. The result is sent to the NetCom to configure the serial port. E.g. the application may be limited to 38,400 bps, but there is a modem capable of 230,400 bps on the serial port. Set Overspeed to a value of 6.000, and configure the application to use 38,400 bps.

“Open If Absent”: The NetCom may be used from a computer with a DialUp connection. When this option is used, the driver will delay the connection to NetComs serial port. Even when an application opens the port, and configures the parameters, no data is sent. The connection is established when data is sent to the NetCom, or when status information is requested.

“Keep Alive”: This option will periodically send control information to the NetCom to check, if the connection is still operational. As a side effect a DialUp connection will not automatically close.

“Passive Modem”: This option controls how often the driver retrieves Modem status information from the NetCom. If activated, the driver never asks for the modem status. Instead the NetCom informs the driver of any changes. If an application frequently requests the Modem status, it gets the last value received. On slow networks like the Internet this option is recommended.

If inactive, the driver software retrieves the Modem status from the NetCom serial port each time the application requests it. With a maximum frequency of 10 per second. If the latest retrieved information is not older than 100 milliseconds, this value is returned.

6.5. REMOTE SETTINGS PROPERTIES

The other panel created by activating the “Advanced” checkbox on the “Performance” tab, is the “Remote Settings” tab.

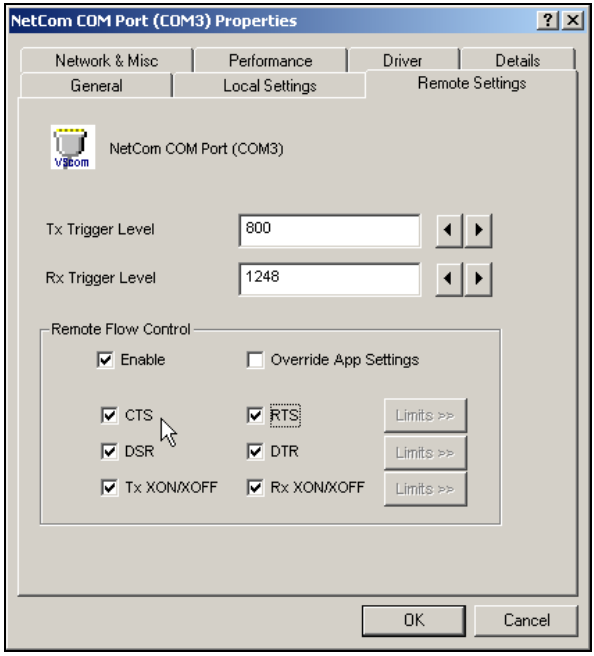


Image 91: NetCom COM Port Remote Settings Properties

The parameters on this tab control the operation of the serial port on the NetCom Device. They are defined and activated by the driver software.

“Tx Trigger Level”: The serial port on the NetCom Device buffers data for transmission to external devices. If the amount of data in this buffer drops below this level, the NetCom is capable to receive new data. It will send a related event to the driver software.

“Rx Trigger Level”: When the serial port has received this amount of data, these are sent to the driver on the connected computer. If the amount is less than this, the NetCom applies a timeout of about 5 character times. This means the timeout varies with the serial transmission speed.

“Remote Flow Control” signals the NetCom to perform the handshake on its own. This is necessary, because the network delay of some milliseconds is to long for reliable operation in many situations. To use this option, Firmware version 1.8.0 is required for the NetCom.

“Enable”: The configuration shown here is active, when the pre-defined performance levels are used. When using the “Advanced” option, Remote Flow Control is completely disabled. Enable as required.

While it is best practice to configure as above, you can disable certain events here. “CTS”, “DSR” and “Tx XON/XOFF” control the output of data to the serial port. And “RTS”, “DTR” and “Rx XON/XOFF” are used to stop transmission from the connected device. An application has the option to use any combination of these methods at the same time. The command to use them is transferred to the NetCom. For example, if the port is configured to use Hardware Flow Control, the NetCom will control the RTS line, and observe the CTS line. If requested, any of these methods may be unchecked. In that case the driver software on the computer will control the lines.

“Override App Settings”: In rare situations it is necessary to ignore the applications configuration. Check this box, and select the Flow Control to use with the device.

“Limits”: These buttons are prepared for future software versions.

7. UNINSTALLING THE SOFTWARE

The drivers and services install as usual. So it is easy to remove the drivers from the system. The entry is found in Control panel, section "Add/Remove Programs". It is removed like other applications.

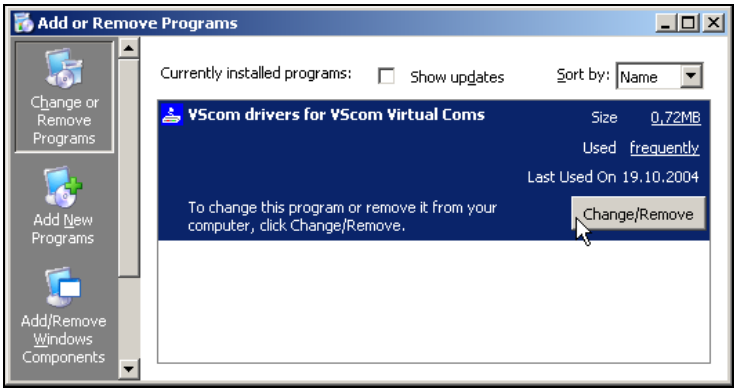


Image 92: To uninstall the NetCom software

You must confirm the uninstall operation and the devices are removed from the system. Further all driver and configuration files are removed from the Windows- and System-directories. A simple de-installation via the Device Manager may result in some driver files scattered in Windows.

There is also a separate uninstall item in the Start Menu. This is the same procedure as in the Control Panel. You are also asked to confirm the de-installation of the drivers.

Image 93: Uninstall in the Start Menu

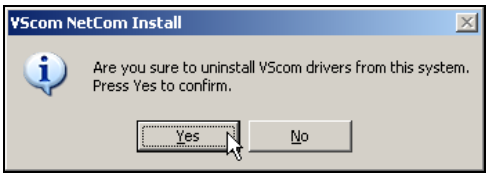


Image 94: Confirm Uninstall of Drivers

You may also start the Installation Wizard a second time. It will detect the installed drivers. The options are to Re-install the drivers, this is similar to a repair installation. And it is possible to completely uninstall the current drivers.

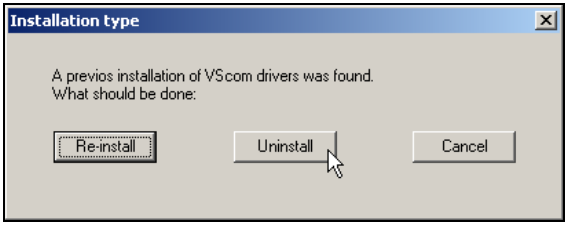


Image 95: Installation Wizard to uninstall Drivers

8. TCP/IP DESCRIPTION

TCP/IP is the protocol used on the Internet. Nowadays it is also used in local networks. This opens access to any device connected somewhere to the Internet. But a simple contact like plugging in a cable is not enough. The network has to be configured. Your network administrator is responsible to do that. If any question during configuration, ask him. Configuration means to set certain parameters in any device and computer.
Since IP-configuration is a frequent source of problems, a little bit of theory is provided here.

8.1. RECOMMENDED SETTINGS

Basically every device on the LAN has a so-called IP-address. In typical small networks the IP-address is similar to 192.168.X.Y, and there is a corresponding netmask of 255.255.255.0. The X ranges from 0 to 255, while Y is from 1 to 254. The combination of X.Y must be unique in your LAN, i.e. two stations must not have the same configuration.

8.1.1. STATIC CONFIGURATION

All stations on the network have a fixed IP-Address. In small networks this is typically of the 192.168-type. To configure NetCom for your LAN, it must have the same 192.168.X as your computer, and the same netmask. So it needs a unique Y to establish communication.

8.1.2. DHCP CONFIGURATION

Another typical configuration is the automatic configuration. This requires a dedicated server in the LAN, which serves as a so-called DHCP server. Every device can send a request, the reply is a special configuration for this device on the network. The NetCom Devices support DHCP, so just activate it.

For best operation the DHCP server itself should be configured. It may identify the NetCom Device by its MAC- or Ethernet-Address. There should be an internal database, to always provide the same IP-Address to stations with a given MAC.

8.1.3. AUTOMATIC CONFIGURATION (APIPA)

A different type of automatic configuration is used by Windows. If the stations are prepared for automatic settings, it will search for a DHCP server (see above). But in SOHO networks this server might not exist. Windows detects this failure, and the computer self-assigns an IP-Address. This address is from the reserved LINKLOCAL block for such purposes. The IP-Address is like 169.254.N.N, where N.N is from 0.1 to 255.254; the corresponding netmask 255.255.0.0 is mandatory. The address is selected by random, and checked if already used.

The NetCom Devices do not support this method. However it is legal to assign a static address from this range to the NetCom. Try to find an unused address in you network, starting at 169.254.0.1. Check by PING and ARP, if the address is used. If not, assign it to the NetCom.

This is only a workaround. The better solution is to install or configure a simple DHCP server program. Typical SOHO Internet routers of today already have such a server. Or you may change your network to static configuration.

8.1.4. OTHER CONFIGURATION

If the configuration of your computer differs from these examples, strong reasons are likely. Ask your network administrator for proper parameters in this situation.

9. HARDWARE DETAILS

So far many details of the hardware are not covered. The information is provided in this section.

9.1. SERIAL PORT

The serial ports in the NetCom Devices follow the specifications of RS 232. On some models it is also possible to use the serial port in RS 422 or RS 485 mode. This is defined by a set of DIP-switches. Here is a list of the available modes and the switch settings.

Warning: a bad configuration may cause serious damage in the NetCom or the connected device.

	Line Mode, Comment	**S1**	**S2**	**S3**	**S4**	Switch positions
RS232	Configuration via serial port Note 1	Off	Off	Off	Off	
	Data communication			On	On	
	Reload Factory values Note 1			Off	On	
RS422	Data communication Point-to-multipoint	Off	On	On	On	
RS485 by ART Note 2	4 wire Full Duplex	On	On	On	Off	
	2 wire Half Duplex with Echo			Off	On	
	2 wire Half Duplex without Echo			Off	Off	
RS485 by RTS	4 wire Full Duplex	On	Off	On	Off	
	2 wire Half Duplex with Echo			Off	On	
	2 wire Half Duplex without Echo			Off	Off	

Table 7: Switch Configuration of NetCom 113, 413 and 813

	Line Mode, Comment	S1	S2	S3	S4	Switch positions
RS232	Configuration via serial port Note 1	Off	Off	Off	Off	
	Data communication			On	On	
	Reload Factory values Note 1			Off	On	

Table 8: Switch Configuration of NetCom 111, 411 and 811

	Line Mode, Comment	S1	S2	Switch positions
RS232	Configuration via serial port Note 1	Off	Off	
	Data communication	On	On	
	Reload Factory values Note 1	Off	On	

Table 9: Switch Configuration of NetCom 211

Note 1: “Configuration via serial port” and “Reload Factory values” is only effective on port 1 of any NetCom Device.

Note 2: ART is the Automatic Receive Transmit control. In RS 485 this is the recommended option. The NetCom performs the required activation and disabling of the RS 485 transmitter by automatic. It is available in NetCom 113, 413 and 813 models.

9.2. SIGNAL ASSIGNMENT

It is of course important to know the exact location of the serial signals in the configured mode. Here are the tables for the DB9 female connectors, as well as for the RJ45 and DB9 male connectors.

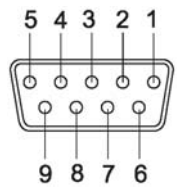
Pin	RS232	422/485 4wire	485 2wire	DB9 female
1	DCD	Rx- (A)		
2	TxD	Rx+ (B)		
3	RxD	Tx+ (B)	Data+ (B)	
4	DSR	Tx- (A)	Data- (A)	
5	GND	GND	GND	
6	DTR			
7	CTS			
8	RTS			
9	RI			

Table 10: Signal Assignment DB9 female

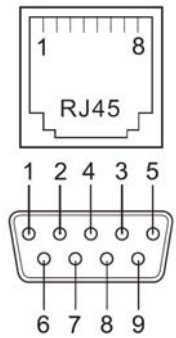
Pin RJ45	RS232	Pin DB9	RJ45 & DB9 male cable
1	RTS	7	
2	DTR	4	
3	GND	5	
4	TxD	3	
5	RxD	2	
6	DCD	1	
7	DSR	6	
8	CTS	8	

Table 11: Signal Assignment RJ45 and DB9 male cable

Please note the GND signal in RS 422 and RS 485 modes. This signal must also be connected between the serial devices. So in reality there is neither a 2-wire nor 4-wire connection. With the exception of very special configurations, a serial cable without GND violates the specifications for RS 422 and RS 485.

9.3. VIEWS OF NETCOM

This section will show the NetCom Devices provided.

Image 96: NetCom-113 (111) Top and Bottom Side

Here showing NetCom 113 (the NetCom 111 is very similar) with the serial connector and the configuration switches on the left side, and the power connector, Reset hole and the Ethernet RJ45 on the right side.

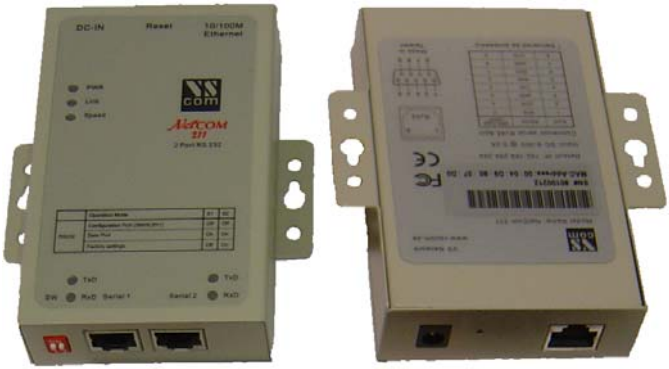


Image 97: NetCom-211 Top and Bottom Side

This is NetCom 211. On the left are the two RJ45 for COM1 and COM2 with the configuration DIP switch. The right side is the same as on NetCom 113 with Power connector, Reset and Ethernet RJ45.

Image 98: NetCom 411 Top and Bottom Side

On NetCom 411 there is the Ethernet RJ45, the single configuration switch and the power connector. On the top side the serial connectors.

Image 99: NetCom 413 Top and Bottom Side

This is NetCom 413 with four serial ports capable of RS232 and also RS422/485. The bottom shows the Ethernet RJ45 connector, the four configuration switches and the power connector. The top displays the serial connectors as DB9 female.

10. TROUBLESHOOTING GUIDE

The most common problems when using NetCom are caused by a failure in the configuration of network parameters. This is a list of some symptoms, and tests to check them.

1) First examine the network configuration of your computer. Open a console window (MSDOS command prompt), and use the command `IPCONFIG /ALL` to retrieve the information. Among other information some data is displayed as this:

```
Ethernet adapter Local Area Connection:

Description.................: <Your LAN card>
Dhcp Enabled................: Yes
Autoconfiguration Enabled....: Yes
IP Address..................: 192.168.1.154
Subnet Mask.................: 255.255.255.0
DHCP Server.................: 192.168.1.1
```

   If DHCP is activated, and there is a DHCP server found, the configuration is OK. A common problem is an IP-Address like 169.254.xxx.yyy, because this is an automated address of APIPA. If no DHCP server is present in the network, a static configuration is recommended. Here we prefer the range of 192.168.1.1 up to 192.168.1.254 for computer and NetCom. Change the computers configuration, and select a similar address for NetCom.

2) Start the NetCom Manager program. Search for the device, the Manager performs a discovery of available NetCom devices. Check the properties of each device for a matching serial number. Once the NetCom is identified, check the IP-Address and the Netmask.

   If all this information is displayed as Zero, the IP-settings do not match your computers settings. To correct this, you need administrative privileges for your computer. Start the NetCom Manager as Administrator, and configure correct parameters in the NetCom. Close the Manager program.

3) **Important:** The default configuration of NetCom may result in a fixed IP-Address. It will be the same for all connected devices. As a side effect the Manager can not send a dedicated configuration to a certain device. Therefore it is best to connect several NetCom one by one, configure them, connect the next and search for that device.

4) Try to PING the NetCom. Open a console window and use `PING <IP-Address of NetCom>` to send some data. The replies should reach your computer in a few milliseconds. If they time out, check the IP parameters again.

5) Telnet to the NetCom. Open a console window, and use the `Telnet <IP-Address of NetCom>` command to connect. The configuration menu appears. If not, open NetCom Manager, and check the setting of "Telnet port" in the NetCom. The default is the name "telnet", or the number 23.

6) Telnet to the serial port of NetCom. Open a console window, and use the `Telnet <IP-Address of NetCom> <data port>` command to connect. Everything you type is sent out through the serial port. Every data received is displayed on the screen. To check the operation, place a standard loopback plug to the serial port. Then you see your own data as an Echo while typing.

7) Check the Device Manager for error messages.

8) Run Hyperterminal, and open the serial port of NetCom device. Use the loopback plug to see the Echo of your typing. Use a Null Modem cable, and connect it from COM1 to the NetCom. Open a second Window of Hyperterminal for COM1. Send some data between these two windows. Transfer a file using ZMODEM protocol.

9) Often so-called Personal Firewall programs cause unspecific errors when other software starts communicating. Check the documentation of the program to see how to allow access.

Many other problems occur because of a failed serial connection, caused by wrong cabling. Here are some frequent causes.

10) The serial cable in RS 232 mode may simply be to long. This mostly happens with higher transmission rates.

11) The adapter provided with the NetCom Devices is not a simple Gender Changer. It is a Null-Modem adapter, and exchanges some signal positions. With the adapter the serial port is like a PC Com1, without it is like a Modem. Do not use this adapter when in RS 422 or RS 485.

12) In RS 422 and RS 485 it is mandatory to also connect the GND signal of all devices. It is a very frequent error not to do this. The information is transferred (and defined) by the positive or negative difference of the Data+ and Data- lines. However the specification requires a common voltage range between the connected devices. To ensure this range the connected GND is required.

13) A network in RS 485 requires biasing resistors. The Data+ line require a pull-up resistor to +5V, and the Data- line need a pull-down resistor to GND. The value is about 750 Ω to 1 kΩ. When no station is transmitting, the Data-lines float. This will cause noise and strange errors. The biasing resistors place a differential voltage to the lines, at least 200 mV. These resistors may exist on the network only once. Therefore they are not implemented in the NetCom serial ports.

11. GLOSSARY OF TERMS

APIPA: Automatic Private IP-Addressing
A scheme to self-assign an IP-Address to a network device. The device selects an address of the LINKLOCAL range 169.254.0.1 to 169.254.255.254 by random. If this address is unused, it assigns it to itself. Otherwise the next address is tested. It became widespread with Windows 98.
The netmask is 255.255.0.0, the addresses are not routed on the Internet.

ART: Automatic Receive Transmit control
Special control for RS485 modes. In RS485 the line driver for transmitting must be disabled (tri-stated) when the device does not send data. In a 2 wire configuration this is known as data direction change, with 4 wire it is called line contention.

DHCP: Dynamic Host Configuration Protocol
A service used to retrieve an IP-configuration from a database.

FTP: File Transfer Protocol
A common protocol to access a file server.

HTTP: HyperText Transfer Protocol
The protocol used by web browsers to access a web server.

Internet: The net connecting networks
A set of protocols to exchange data between different networks. These information's are carried via a global network of fibres and satellite links.

IP: Internet Protocol
The basic definitions for data packages. These Internet frames are stored and transported embedded in data frames of the local network.

IP-Address: Internet Address
The Internet address is noted as a group of 4 decimal numbers. Each station on the Internet has a unique address. Some ranges are reserved for private networks, not connected to the Internet.

LINKLOCAL:
This is a reserved address range for private (i.e. not connected to the Internet) networks. Designed for small number of stations. Used with APIPA.

NAT: Network Address Translation
A technique to have a private LAN share one public IP-Address. With NAT the transport information in IP-frames is exchanged by the public data of the NAT-Router.

Netmask: Groups stations to a Net
The AND-operation between the IP-Address and the Mask is an important value. When to stations have identical value here, they are “in the same net”. Which means they can communicate direct, without transmitting to a Router.

Router: Transmits data over the Internet
The backbone devices of the Internet. Routers connect two networks together. On one side they receive data frames containing IP-data. They extract these data, and send them on another side; there also stored in data frames of the second network. Typically they connect more than two networks. The basic task is to decide which route the IP-data must take now.

RS-232/V.24: common serial transmission
Characters are sent as separate bits, timing is well defined. The medium is copper cable, using typical +/- 12 Volt. Each signal is defined related to a common ground; one wire per signal plus GND.
RS-232 is a point-to-point connection.

RS-422: Industrial serial transmission (multidrop)
A transmission method with differential signals. Allows higher speed, longer cables and is resistive against electrical noise. RS-422 allows for up to 16 receivers. The transmission is via twisted pair copper cable using differential signals. Sender and receivers must share a common voltage range (max. +/-7Volt difference). Two lines per signal, plus common GND.
RS-422 is a point-to-multipoint connection.

RS-485: Industrial serial transmission (multipoint)
The signals and cables are the same as RS-422. The transmitters can go tri-state. Several stations can send data on the same lines, at different times.
RS-485 is a multipoint-to-multipoint connection.

SNMP: Simple Network Management Protocol
A general purpose configuration system. Devices understanding SNMP may be configured and monitored.

TCP/IP: Transmission Control Program/Internet Protocol
TCP establishes connections between two partners via the Internet. The data is sent in IP-frames, each frame is acknowledged be the recipient. Lost packages are repeated.
Software using TCP has a secured transmission; the delivery of the data is guaranteed.

UDP: User datagram protocol
Similar to TCP the data is sent in IP-frames. But in opposite there is no connection or acknowledge by the recipient. The transmission is faster for small data, but data can get lost.
Software using UDP must handle the related problems.